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HOUSING AND TUBERCULOSIS.[1]

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The work which is to engage our attention resolves itself largely into a tremendously important question — one, indeed, probably never more important than to-day. The relation of housing conditions to the origin and spread of various forms of tuberculous diseases is a subject of far-reaching importance. I propose to present some facts and figures relating to this complex problem.

It is an accepted axiom that our highest death-rates exist in the poorest localities. The truth of this does not require to be laboured, but it is of the first importance that we should recognize precisely *to what extent* the influence of locality or housing affects the origin and spread of disease generally, and tuberculosis in particular.

I shall attempt to uphold the proposition that the number of cases of pulmonary tuberculosis in any district is almost precisely in direct proportion to the number of houses of one and two apartments which exist in it. While I think it is possible to demonstrate this fact beyond doubt, it is nevertheless one in regard to which a considerable amount of confusion appears to exist.

I find in many annual health reports statements to the effect that the incidence of pulmonary tuberculosis is much greater in houses consisting of two rooms than in those of one apartment, and in various

[1] Abstract of a Presidential Address delivered last year at the Edinburgh Congress of the Royal Institute of Public Health.

accepted works on vital statistics this is emphasized. At first sight the statement is inexplicable, if, as we imagine, the origin and spread of the disease is influenced largely by absence of fresh air, overcrowding, and other non-hygienic conditions. A careful scrutiny, however, makes it quite possible to explain the fallacy and to warrant the statement that the number of cases of tuberculous disease increases in proportion as the house accommodation becomes limited. This is shown in the following table:

TABLE I.—INDICATING THE INCIDENCE OF PULMONARY TUBERCULOSIS IN RELATION TO SIZE OF HOUSES IN EDINBURGH.

	Population.	1910.		1911.		1912.	
		Percentage to Total Notifications.	Rate per 1,000 Inhabitants.	Percentage to Total Notifications.	Rate per 1,000 Inhabitants.	Percentage to Total Notifications.	Rate per 1,000 Inhabitants.
One room ...	18,608	15·0	6·1	13·2	7·4	10·2	6·9
Two rooms ...	94,909	42·7	3·4	43·6	4·8	42·6	5·6
Three rooms ...	69,686	19·6	2·1	18·5	2·7	19·6	3·5
Four rooms and over	122,086	17·3	1·0	12·4	1·0	14·5	1·4
Institutions and lodging-houses	—	5·2	—	12·1	—	12·9	—

From the above table it appears that, while 15 per cent. of the total notification of cases of pulmonary tuberculosis occurred in houses of one room, 42·7 per cent. occurred in those of two apartments. The fallacy becomes apparent when we remember the fact that, obviously, a much smaller proportion of the population live in one-roomed houses than in those of two rooms, and it therefore becomes essential to calculate the rate of incidence per 1,000 of the population. If this method is adopted so far as the City of Edinburgh is concerned (and I have ascertained that the same statistics apply to other large centres of population), it is found that, while 1 per 1,000 of the population are affected by the disease in houses of four and more apartments, 2·1 exist in houses of three rooms, 3·4 in houses of two rooms, and 6·1 in houses of one room. Clearly, therefore, the disease increases with rapid strides in proportion as the house accommodation becomes more limited and objectionable.

The city of Edinburgh is divided into different wards, and from the figures in the accompanying table it will be at once apparent that the number of cases of pulmonary tuberculosis follows almost precisely in direct proportion the number of one and two roomed houses which are found in any of the wards.

TABLE II.—INDICATING PREVALENCE OF PULMONARY TUBERCULOSIS IN THE VARIOUS WARDS OF THE CITY OF EDINBURGH.

Ward.	Number of One and Two Room Houses.	Death-Rate per 1,000 of Population.	Pulmonary Phthisis Notifications per 1,000 of Population.	Infant Mortality.
Calton	1,901	13·5	3·7	93
Canongate	2,793	15·2	4·0	113
Newington	534	12·4	1·5	46
Morningside	144	10·9	1·4	29
Merchiston	734	11·1	1·4	58
Gorgie	1,718	11·6	2·6	81
Haymarket	516	11·6	1·4	104
St. Bernard's	915	11·5	1·5	66
Broughton	1,173	11·2	2·5	80
St. Stephen's	1,150	13·9	2·2	78
St. Andrew's	1,302	13·1	3·5	106
St. Giles's	3,010	21·5	6·2	142
Dalry	3,103	13·9	4·1	107
George Square	2,093	14·9	4·4	135
St. Leonard's	3,325	16·2	4·4	125
Portobello	1,086	14·3	2·1	116
City	—	14·3	3·1	101

Six one-apartment houses in St. Giles's to one in Dalry.
Five ,, ,, St. Leonard's to one in Dalry.
Three ,, ,, George Square to one in Dalry.

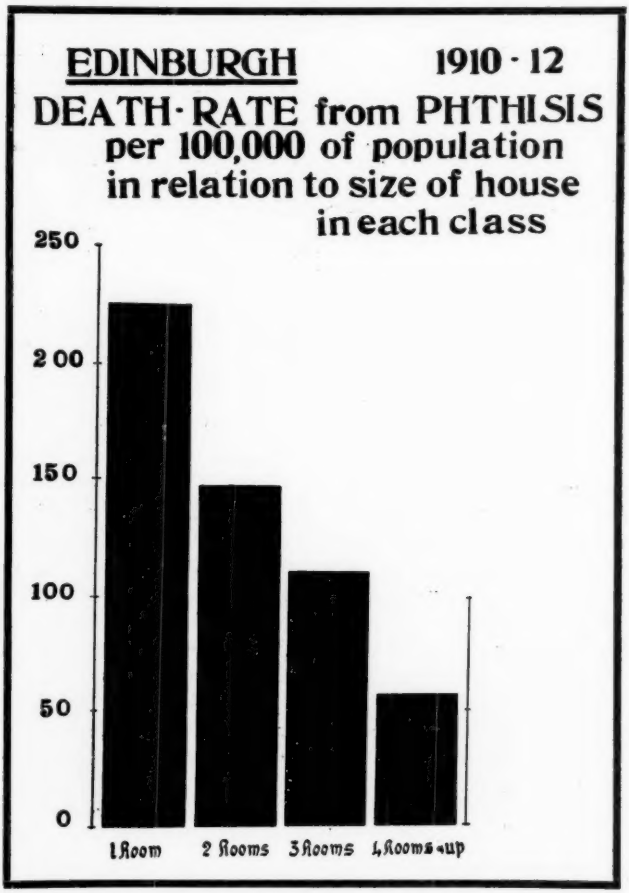
Another interesting fact can be gathered from these very convincing figures, as indicating the statements already made, to the effect that the number of cases of the disease increases in proportion to the number of the smallest class of house. The figures referring to Dalry Ward indicate that there are 3,103 houses of one and two rooms, with a death-rate of 13·9. In St. Giles's Ward, however, where there are 3,010 houses of one and two apartments, the death-rate is 21·5.

At first sight it seems difficult to reconcile these figures, but light is thrown upon the subject at once when it is stated that for every house of one apartment in Dalry Ward there are in the proportion of six similar houses in St. Giles's.

The accompanying series of charts emphasizes very clearly the facts I desire to bring out. I have selected three of the largest centres of population in Scotland—viz., Edinburgh, Glasgow, and Greenock—and it is full of interest to glance at the charts referring to these districts, and to see how enormously the death-rate from phthisis rises in almost direct proportion to the limitation of the house accommodation. In Greenock, for example, 87 deaths in houses of four rooms and upwards, 106 in three, 179 in two, and 222 per 100,000 in houses of one room. In Glasgow, while there are 70 deaths in houses of four rooms and upwards, there are 120 in three, 180 in two, and 240 in houses

of one room, and in Edinburgh there are 56 deaths in houses of four rooms and upwards, 111 in three, 146 in two, and 225 deaths in houses of one apartment.

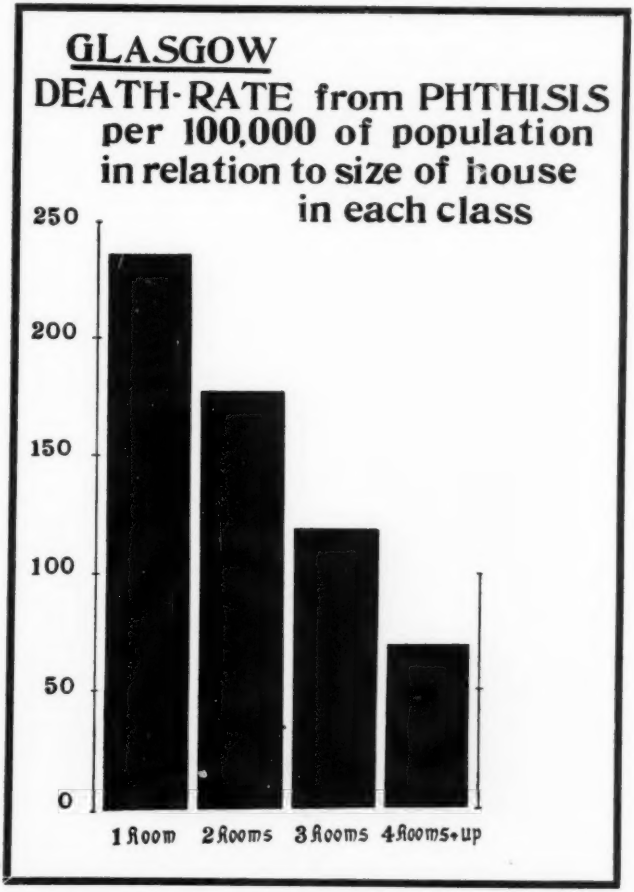
The accompanying illustrations of certain views of some areas in



Edinburgh Public Health Dept.

Edinburgh will help to explain matters. These show densely crowded localities with an enormous proportion of houses of one and two apartments, and with a death-rate from tuberculous diseases in the first instance of 4·4, and in the second of 3·2.

If the above facts regarding the influence of housing on the origin and spread of tuberculous disease be correct, and if it be true that about 60 per cent. of the total notifications of pulmonary tuberculosis are in connection with cases which occur in houses of one and two



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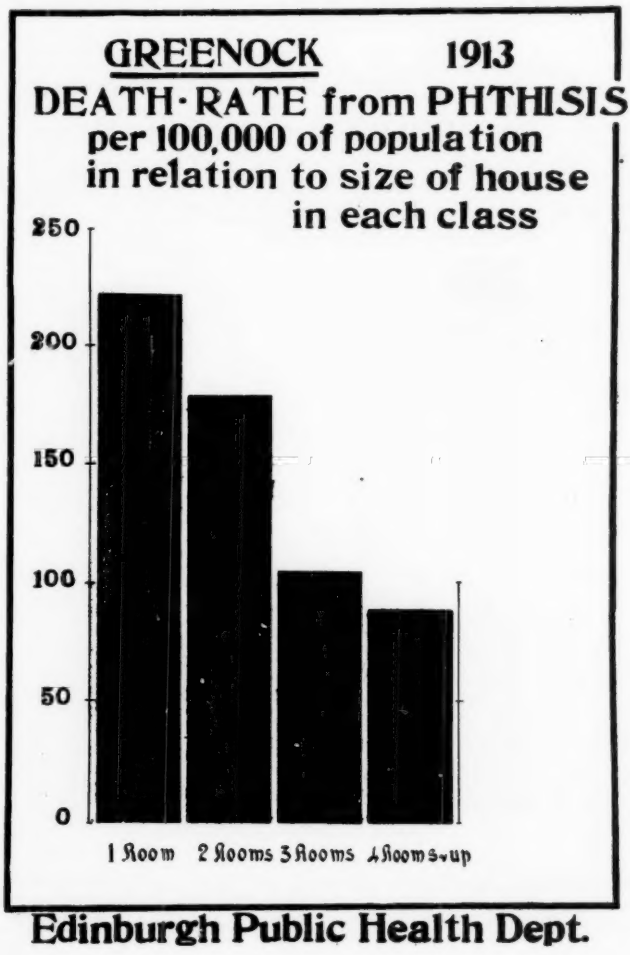
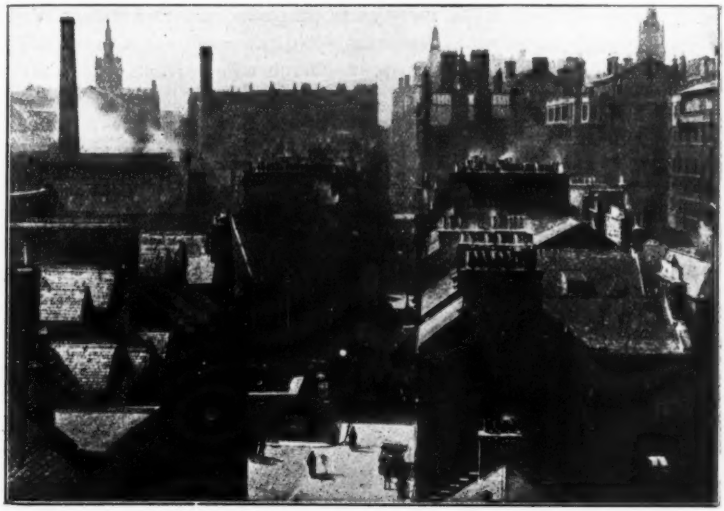
rooms, let me suggest the proposition that recent legislation in the absence of sweeping schemes of housing reform is likely to be insufficient *per se* to meet the urgency of the situation so far as tuberculous disease is concerned.

It is claimed by some that the key to the situation lies largely, if not wholly, in the carrying out of the provisions of the recent Insurance Act, especially so far as dispensary, domiciliary, and sanatorium benefit are concerned, and many arguments in favour of this contention have



been based upon the figures applicable to recent times. These undoubtedly show an unquestionable fall in the incidence and death-rates of tuberculous disease. It is all-important for us, however, to take a large and comprehensive view of statistics and to examine these most critically



A CHARACTERISTIC VIEW OF OLD EDINBURGH.

A CROWDED PART OF OLD EDINBURGH.

if we are to be justified in drawing conclusions from them. There can be no question but that for many years past the death-rate from tuberculosis has, practically all over the world, shown a satisfactory fall. The following table shows clearly, in quinquennial periods since 1881, the extraordinary extent to which these rates have fallen in almost every country. It is unnecessary to single out a specific instance. Any one selected at random may be taken as a fair example of the others, and no exceptions exist to the general fall.

TABLE III.—INDICATING MORTALITY FROM PULMONARY TUBERCULOSIS IN VARIOUS CITIES OF THE WORLD.

Death-rate per 1,000 *living.*

Cities.	1881–1885.	1901–1905.	1912.
London	2·22	1·60	1·35
Edinburgh	2·12	1·61	1·08
Glasgow	3·11	1·76	1·31
Dublin	3·46	3·09	2·45
Belfast	3·82	3·07	2·05
Melbourne	2·33	1·39	1·04
Toronto	2·03	1·74	—
Paris	4·41	3·90	3·32
Amsterdam	2·38	1·44	1·22
Copenhagen	2·73	1·44	1·37
Petrograd	5·49	3·12	2·87
Moscow	4·11	2·68	2·44
Berlin	3·39	2·26	1·68
Leipzig	3·70	1·93	1·59
Vienna	6·85	3·36	2·37
Milan	3·35	2·32	1·69
Venice	3·06	2·00	2·16
New York	3·98	2·15	1·70
Chicago	1·80	1·52	1·44
Buenos Aires	2·70	1·84	1·66

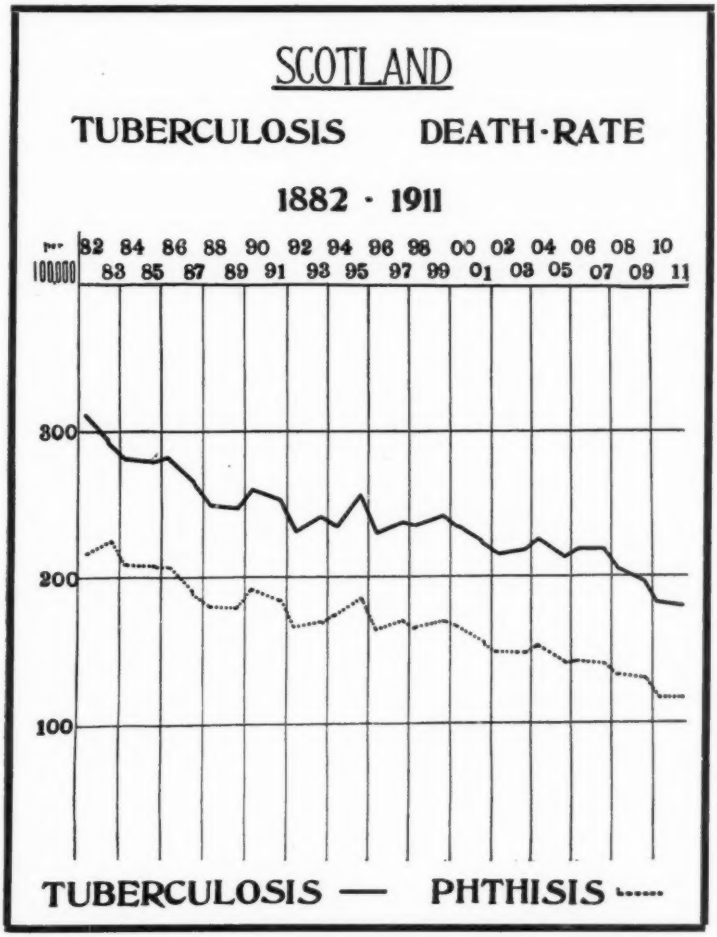
Scotland generally has, of course, been no exception, and has shared in the unquestionable fall during the like period. But it is all-important for us to remember that, while these facts are so certain, tuberculosis does not *alone* occupy a position on the descending scale: precisely the same facts exist in regard to other forms of infectious disease.

The next table seems to go to prove the truth of my contention regarding the mortality rates as they affect Edinburgh, and it will be seen that what has been said regarding the general fall in these throughout the world applies also here.

TABLE IV.—INDICATING MORTALITY RATES IN EDINBURGH.

Death-rate per 1,000 of Population.

Years.	All Causes.	Phthisis.	Enteric Fever.	Diphtheria.	Scarlet Fever.
1882–1891	18·37	1·97	0·18	0·22	0·24
1892–1901	17·59	1·78	0·11	0·18	0·19
1902–1911	15·28	1·30	0·03	0·14	0·09
1912	14·63	1·26	0·01	0·09	0·03
1913	14·39	1·13	0·03	0·09	0·11

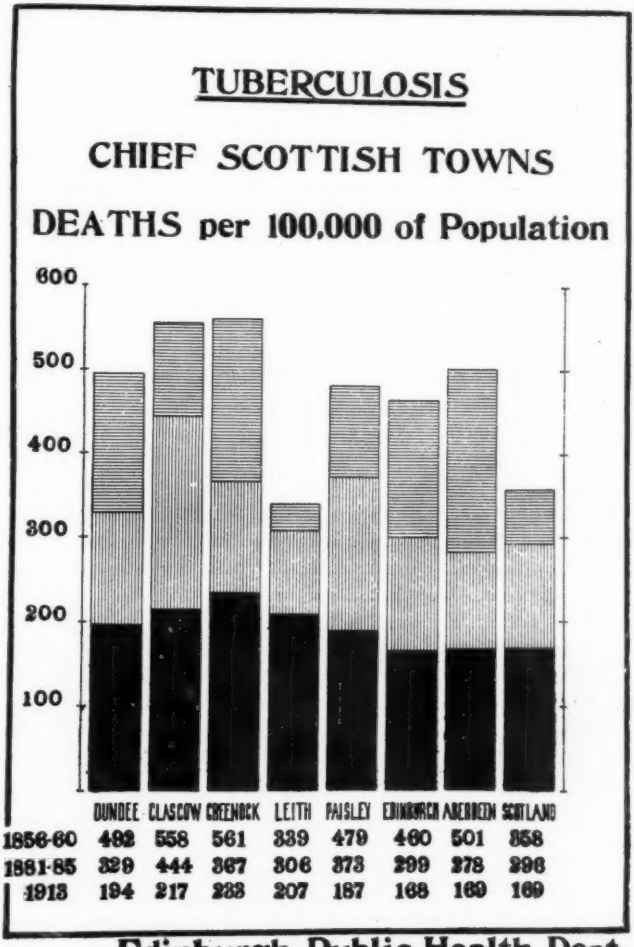


It will be noted that from the year 1882, when the phthisis rate was 1·97 per 1,000 of the population, it has last year fallen to 1·13 per 1,000. It will be further noted that the rates of all the other forms of infectious disease specified on the table have fallen to at least a like extent; and it is further to be borne in mind that, before conclusions can be drawn from these figures, the other tables referring to the statistics of the world and Scotland are also to be kept well in view. In the absence of these it is perfectly possible to draw erroneous conclusions, and to attribute certain results to have followed from specific causes, and these only.

In the next chart much information is obtainable in regard to the course which has been followed by tuberculous diseases in the eight large centres of population in Scotland since the beginning of the registration period in 1856. The highest reaches of each column indicate the tremendous extent to which these diseases existed at that early date, while the middle line in each column shows the progress that was made in each city up to the year 1885, and the lower black column shows the still further progress and indicates the position in each of these centres to-day. All have experienced a marked decrease in numbers. That decrease has been a continuous one throughout the whole period, and while at the early date enormous differences existed, a somewhat levelling-down process has taken place in recent times, as is evidenced by the closer approximation of the various series of black columns. Indeed, we find to-day that Edinburgh and Aberdeen, which show similar results, are also in precisely the same position, as is shown by the average figure applicable to all Scotland. The diagram, however, is useful in another direction, as it shows clearly the progress which has been made in each city towards combating these diseases within certain specified dates. Let us look at the lower two lines of figures at the bottom of the diagram. There we see that from 1881, when the number of deaths from tuberculosis in Glasgow represented 444 per 100,000, the figure has fallen to 217 at the present time; that at the same date the number of deaths in Paisley was 373, and now has fallen to 187; Aberdeen, 278, now fallen to 169; Edinburgh, 299, now fallen to 168; and the interesting fact that, while in 1881 the average for all Scotland was 296, it has now fallen to an almost similar figure of 169 per 100,000. This almost uninterrupted progress of dealing with tuberculous disease throughout the world has been carried out generally without any aid from the more recent developments which legislation has now placed at our disposal.

It is, perhaps, well for us to consider in how far the provision of sanatoria and dispensaries will further the crusade, if these are unaccompanied by providing for the clamant need of dealing directly with the cause rather than to attempt to cure the effect, and I feel

that this all-important phase of the subject will form the basis of the various discussions that are likely to take place in this section of the Congress. Indeed, it is possible to state the question another way.



Is the hope of a successful crusade to be chiefly based upon a clinical treatment of persons suffering from the disease, or of the still further and wider adoption of the preventive methods, the administration of which in the past have so successfully resulted in the reduction of

death-rates of all other forms of infectious disease? The sanatorium is a hospital, and its very existence, indeed, is an admission of failure of preventive methods; but there is an important respect in which a sanatorium differs from an infectious diseases hospital. To the latter patients are sent whilst suffering from a form of infectious disease, and on their return home cured are freed from the responsibility of carrying infection with them. Most unfortunately, these conditions do not accompany to any appreciable extent the treatment of pulmonary tuberculosis in the sanatorium. It is the experience of all of us that a small proportion of patients—indeed, very small—when discharged, can be regarded as free from infection, and a still smaller proportion can be certified as cured. There is a sense, indeed, in which the temporary improvement which may be brought about in many of the patients treated in a sanatorium may be regarded from a preventive point of view as anything but an advance.

The majority of the patients admitted to sanatoria are removed from the poorer and working class districts. Experience indicates that, almost however far the disease may have progressed, a certain modicum of improvement takes place under the improved conditions—feeding and treatment. After the lapse of a varying period—say from three to six months—the survivors are permitted to return to precisely the conditions where they formerly lived.

I have within recent times given much attention to this particular phase of the question, and have been driven to the conclusion that the home conditions to which our sanatorium patients return after treatment cannot be expected to lead to any other result than an aggravation of the disease, and an undoing of the benefit which has accrued from sanatorium treatment within a longer or shorter period.

It must be borne prominently in mind that the disease of which we are treating is not a curable one in the ordinary sense of other forms of infectious disease which are in this condition before discharge from hospital. I feel certain it is the experience of all of us that the outcome of sanatorium treatment is, to state it very temperately, not satisfactory so far as cure is concerned in the vast majority of cases.

One undoubted authority, whose experience is unquestionable, said, in a recent discussion upon the subject, that, of the 2,800 cases which came under his own immediate supervision, only as many as could be counted on one's fingers could be said to have completely recovered. This statement may be accepted in whole or in part, but taken in conjunction with the other figures to which reference has been made, and with the experience of many in other large centres, it seems to prove very conclusively indeed that, while the clinician has his place, and his important place in connection with the crusade against consumption, and while precisely the same may be said in regard to

dispensaries and sanatoria, the battle must be fought mainly by, and the issues must rest largely in the hands of, local authorities and their medical officers, in carrying out to a greater extent even than has been heretofore the preventive measures which, to a certain extent at least, have served to bring about a very considerable fall in the prevalence of this disease.

The key to the situation lies unquestionably in the housing question. If statistics prove anything, they prove to the hilt that the disease originates and thrives in direct proportion to the unsatisfactory nature of the house and its surroundings; and they prove invariably that an improvement on these conditions is followed, as by the law of cause and effect, by an immediate fall in the tuberculosis rate. One almost wonders why we are so slow to learn these facts. Every local authority knows them well, and every medical officer of health, I am satisfied, is intimately acquainted with them; but it must be admitted that the progress in housing reform is, to say the least of it, not in proportion to our knowledge in regard to these matters. Innumerable illustrations exist of the improvement which follows the outlay of some expenditure in improving the housing conditions, which ought to serve to convince many of us who might be slow to believe. Possibly every local authority can furnish its own statistics. We in Edinburgh certainly can. Wherever improvement schemes have been carried out, an immediate improvement has primarily been noticed in the tuberculosis death-rate. In every large centre of population precisely the same experience has been met.

It is well to remember the operations which have been carried out in London under the supervision of the governors of the Peabody Fund. As most are aware, large objectionable areas were removed in unhealthy districts of the City, and good sanitary, up-to-date accommodation for working classes substituted. I find from the report just issued that the number of persons housed under this scheme is nearly 22,000; that the average weekly earnings of the head of each family was 22s. 3d.; that the death-rate last year among this large population was 10·4, as compared with 14·3 for the whole city of London. The population of working people, therefore, who live in these sanitary houses shows a death-rate of 3·9 below the average of the whole city. I have not the statistics applicable to tuberculous diseases, but it is safe to conclude that these, in like manner with the other figures, show a satisfactory result.

Progress, then, in our attempt to overcome the ravages of tuberculous disease, must be along the line of improved housing conditions. Town-planning schemes should be actively pushed forward, but that by no means exhausts the possibilities. Existing conditions specially must be actively dealt with. It seems largely to be beating the air if

we continue to talk about town-planning schemes for the future while our dense, crowded, insanitary slums are found everywhere existing. These should, in the light of our knowledge of the present day, be dealt with by a firm hand. If what are termed unhealthy houses are found to exist, and collections of these constituting unhealthy areas where death-rates are high, the conditions are then present which beyond all manner of doubt prejudicially affect the health and life of those who reside in them, and nothing short of a clearance, by whatsoever means accomplished, can for a moment be justified.

The question of expenditure is always, of course, a prominent one; but in these times, when so much is being lavishly laid out in certain directions, it is to be sincerely hoped that what appears to many of us, at any rate, as the most important factor will not much longer continue to occupy a secondary position. It may be that local authorities must acquire old property and build new at a loss, and that the expenditure of ridding large centres of population of their unhealthy housing conditions is considerable. Surely, however, it is not extreme to claim that the profit in improved health conditions, and therefore in the ultimate saving of hospital and sanatorium outlay, would be a perfectly assured one.

The carrying out of improvement schemes is frequently hindered by the difficulty experienced in obtaining house accommodation elsewhere, and it is frequently urged that private enterprise is less and less inclined to provide this, as the financial inducement is not a bright one. I feel strongly, however, that the continued existence of unhealthy dwellings of itself is an element which serves to prevent a demand for more up-to-date accommodation, and in the absence of this demand the supply is not forthcoming.

I have recently had a census taken with the view of obtaining some information regarding the position, financial and otherwise, of the occupants of about 1,000 houses of one and two rooms in this city, and I find that there is a decided tendency on the part of a certain class to occupy a smaller and poorer type of dwelling than is justified by their financial position. It may be definitely said that, so long as these slum dwellings exist, there will be found people who will occupy them, and spend their money, which should be legitimately laid out in rent, in other and, in many instances, less worthy manners. I find in my returns that in a large number of cases persons in receipt of 30s. per week occupy a one-roomed house, and in some instances sums even reaching over £3 per week are earned by the occupants.

The same results are found to apply to houses of two rooms; and it appears clear that, if the smaller and poorer classes of houses, with the cheapest rents, were, where necessary, condemned and removed, considerable numbers of such occupants, who could well afford to

occupy better dwellings, would find no difficulty whatever in procuring suitable accommodation, and in the presence of such a demand it is not unreasonable to suppose that the supply would not be long in being forthcoming. Whether this be so or not, however, it is perfectly clear that a community, if not urged by humanitarian considerations, must of necessity, even if from no higher motive than that of self-preservation, deal rigorously with the black spots in their cities from which emanate by far the largest proportion of tuberculous disease.

Finally, one may summarize the points which I have desired to bring forward:

1. Pulmonary tuberculosis is a disease which in 70 per cent. or 80 per cent. of cases occurs in houses of three rooms and under; the number of cases is larger in two-roomed houses than in three; larger in houses of one room than in two; and the number of cases of tuberculous disease increases almost in direct proportion to the number of small houses in any district or ward of a city.

2. That since the year 1882 the number of deaths from tuberculosis has shown a rapid and steady decrease; and a like statement applies to the general death-rate and the death-rate from other forms of infectious disease.

3. That this decrease has been taking place quite apart from, and irrespective of, any special effort to deal with the condition other than the preventive measures which have been carried out in the ordinary march of public health administration.

4. That the establishment of sanatoria and dispensaries, while useful aids in carrying on a general crusade against this form of disease, are not of themselves likely to be attended by markedly beneficial results in the absence of other definite preventive measures.

5. That preventive measures centre largely in the housing question, and that, irrespective of cost, there is an urgent need, in the light of our present-day knowledge, of dealing more effectively than has heretofore been the case with congested areas, dense foci of population, and insanitary dwellings.

REFLECTIONS ON TUBERCULOSIS AND TUBERCULIN.

By E. S. BULLOCK,
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Some months ago I received a letter from Dr. Trudeau, and at odd minutes I have been thinking about it ever since. In fact, it inspired new lines of thought, and indirectly caused me to go over the whole subject of tuberculin once more, with the idea of gaining a greater degree of intellectual satisfaction in its use. Though in the letter there was no reference to tuberculin, the connection will appear as I go on. Dr. Trudeau said: "After thirty-five years of active tuberculosis work, I am convinced that there is no such thing as a real immunity in tuberculosis, nor possible of attainment; and if I had my life to live over again I would devote it to the search for some chemical substance which would kill the tubercle bacillus without undue injury to the affected organism." Originating with an ordinary person, such a statement need not necessarily excite comment, for one's freedom in the expression of opinion bears an inverse relation to one's responsibility; but, having such a source, we may properly pause, listen, and wonder. We may profitably examine this brief but pregnant statement, which may be the summation of the work and thought of a lifetime, and which, if it turns out to be fact as well as opinion, practically discards, as regards tuberculosis, all the bacteriologic delving of the past thirty years. If the good doctor is right, further study of the tubercle bacillus and its products must be useless, and also the search, in this disease at least, for antibodies, antigens, and bacteriolysins. Tuberculin, too, comes up for re-examination; for by inference, if not directly, it is implicated in the discussion, as it stands as the one and only practical achievement of bacteriologic investigation in tuberculosis, and thus it becomes all the more important to clarify its position, especially as, after more than twenty years of use, its action remains to many very mysterious, and its therapeutic position somewhat equivocal.

Medical men are, generally speaking, prone to be impressed by the written word, though this is, indeed, a universal fault. That which is spoken we have less difficulty in evaluating, but with the written word it is different, and this often seems more exact, more truthful, than it really is, especially if it emanates from Germany, or some source we have long been accustomed to consider *ex-cathedra*. Pragmatic,

practical, or apparent truth, may be all right in philosophy; but followers of Æsculapius should strive for a higher degree of truth than satisfies the followers of William James and Bergson. With this thought in mind, it seems to me necessary to examine the psychology of the writer of the statement quoted above. The statute of limitations has not run out in my friendship and admiration for Dr. Trudeau, and so it is with hesitation that I inquire into his state of mind when he wrote it. In fact, it might seem to some that, being contained in a personal letter, I have no right to use it, though he himself would be, I am sure, the first to exonerate me from the charge of breach of confidence. His interest in medicine is too deep and true to take refuge in any pettiness whatever. He is a spirit as well as an intellect, and thirty or more years of struggle with tuberculosis in his own person, as well as in that of his friends and patients—seeing suffering, death, and destruction on all sides through so long a time—may have injured the spirit, even though the intellect be left intact, as I certainly think it has. The statement of his position is most pessimistic, if not hopeless, and all who know him are sure that an unquenchable optimism in medicine, as in all other relations, has been as much a part of him as his life of unselfish devotion to the cause of science and afflicted humanity. It seems right to conclude that—for the time, at least—the great heart and spirit are bowed down, and only the pessimistic factors in the tuberculosis situation are visible to him. This seems very true to me; for a critical examination of what he wrote serves but to convince me that he is wrong, and that but a modicum of reality resides in his statement. With this explanation in mind I can proceed with its analysis.

Like most great men, Dr. Trudeau has the faculty of saying much in a few words, and I hardly remember anything medical, at least, which occupies so little space and can mean so much. Aphorisms and epigrams are often dangerous, for they depend upon generalizations, which, though appealing, will not bear critical examination, and I fear that Dr. Trudeau has sprung a trap set long ago by Rochefoucauld, and, more recently, by Bernard Shaw. He says: "No real immunity to tuberculosis exists." I am persuaded that by this he means that there are no people in the world who cannot contract it. Quite true! If our delicate bio tests and exhaustive post-mortem investigations have taught anything, it is that among civilized people tuberculosis is a universal infection. Nevertheless, the statement is a half-truth, and a useless exaggeration of the unfavourable factors in the problem. Because, though all contract it, all do not die of it, or even become ill because of it—in fact, but one-seventh finally succumb. When we consider the enormous fatality which attends tuberculosis among peoples not heretofore subjected to it—negroes in Africa, and American

Indians—we can only conclude that among those long living in contact with it there must be a very real, if only a relative, immunity. It seems perfectly true that, physicians or no physicians, science or no science, Nature is quietly—but none the less persistently and effectively —immunizing the human race against tuberculosis.

Immunity in Tuberculosis.

We certainly understand and recognize that the tuberculous body possesses to a marked degree immunity to extensions of the disease to distant parts, otherwise the tuberculous would all die of a rapidly disseminated tuberculosis. We know, also, that certain tissues—the muscles, for instance—are practically immune. It has been demonstrated, as well, that the tuberculous animal is immune from new infection from the outside. Koch, in his early experiments, showed that a tuberculous animal reacts to a second inoculation differently than a normal animal to a primary infection. The tuberculous animal antagonizes the second infection by means of an inflammatory area about the site of the second inoculation, which results in necrosis and recovery without extension. Koch also proved that when the tuberculous animal is injected with certain doses of dead bacilli the result is fatal within a few hours, while the same dose administered to healthy animals is without effect. Although Rohmer and Hamberger have confirmed this work, they have shown that to get the classic results the experiments must be conducted in a certain way. The first inoculation must be small enough to cause a slow and chronic process. The animal must not be overwhelmed, and the second inoculation must be made after an interval sufficient to permit full sensitization. Thus, we must recognize that in the tuberculous animal there is a real immunity to reinfection. The tuberculous animal can do what the healthy animal cannot do—namely, institute at the point of infection an inflammatory war with migration of leukocytes, engulfment and digestion of the invading bacilli. The fixed cells, also sensitized by the first infection, have elaborated their specific ferment or zymogen, and take their part in the battle, which, under the phenomenon of sensitization, invariably results in the annihilation of the invaders. Thus, we see that the tuberculous animal can digest parenterally either dead or living bacilli. If such are introduced into the tuberculous animal in sufficient quantity the animal will at once succumb to his own defence. Its very perfection proves fatal. This seeming paradox resolves itself, when we consider the mechanism. The ferment, by means of which the bacilli are digested, splits the proteid structure of the organism, thus freeing the extremely toxic principle contained in bacilliary, as in all other proteids. By varying the dose of dead bacilli every grade of toxæmia, from slight to fatal, can be faithfully reproduced.

We are, therefore, not only justified in the conclusion that in these phenomena we not only have the characters of a very real immunity, but are justified as well in going further, and can point out that this immunity must be due to something which effectively disrupts the bacilliary proteid—namely, tuberculous animals possess a zymogen for tubercle bacilli, which is probably specific, and which, though it does not exist in the normal animal, does exist in the tuberculous animal, or, stated differently, in the sensitized organism. Lowenstein has aptly said: "Only the tuberculous are tuberculosis immune." We seem justified in the further conclusion that the lifelong and very practical immunity possessed by six-sevenths of the human family must be largely the result of a primary and insignificant infection, with its resulting sensitization, or, as might be said, state of preparedness. This mechanism Nature is undoubtedly perfecting all the time. If this immunity be a fact, and not a figment of the imagination, the question is apropos, Why does it fail in the other one-seventh, and result in enormous tuberculosis morbidity and mortality among civilized peoples, so that it is justly termed the tuberculosis problem? As far as we know the reality, immunity to tuberculosis is dependent upon but one factor, a zymogen, which digests tubercle bacilli dead or alive, though, of course, secondarily, the vitality of the cells is important. In fact, the practical phenomena of sensitization are manifested to us solely as the effects of a disrupting force applied to the bacilliary body. In the laboratory this force may be hydrolysis by means of acids or alkalies. Not so in the living body, however, for we certainly know that the only force or forces residing in the living organism sufficiently potent to disrupt organic molecular structure exists in the ferments, and in them alone. Taking this tuberculosis zymogen as a demonstrated fact then, we are in a position to reply to the question, Why does one-seventh of the human race succumb to tuberculosis? Analogy does not teach that this ferment is necessarily indefinitely self-perpetuating. Rather, the contrary is true, for it is certainly understood that the immunity resulting from an attack of typhoid-fever continues but a few years at best. This is also true of coryza and many other infections. To be sure, some diseases are followed by a lifelong immunity, and we can only regret that this is not true of tuberculosis. In this disease the specific zymogen is called into being by the original infection, and when Nature's cure is complete, through fibrosis and calcification, it tends to fade out, or at least to be much diminished. This conclusion is borne out by the fact that, though most people will react to the skin-test, most will not react to the subcutaneous test. Certain cells retain their sensitiveness; others do not, or at least it is diminished below the effective point. Koch, when working with tuberculin, took a large dose himself with-

out effect, and yet th re is little doubt that careful examination of his body would have shown the cicatrix of a previously existing tuberculosis. Sensitization phenomena are conspicuous by their absence when the body is overwhelmed by the disease. This has a practical bearing which we will have occasion to refer to later. The conclusion is justified that immunity in tuberculosis is a variable process in different people, lasting longer in some, and a shorter time in others. We may properly go farther, and say that one person may respond sooner to the specific stimulation for the manufacture of zymogen than another, and one may make it in greater quantity than another. This is where the soil comes in.

Reactions of the Body to the Tubercle Bacillus.

At this point the question seems to arise, Why is not tuberculosis a self-limited disease like pneumonia, for instance? This is a legitimate query, and one which I believe can be answered. The first reaction of the body to the presence of the bacillus is not the manufacture of a specific zymogen, which evidently is a gradual process requiring time for its development, but rather the mutual action and reaction between host and parasite which we designate as the tubercle, the result of a specific irritation applied at one particular spot. The tubercle, it must be remembered, is not characteristic of tuberculosis alone. It is a bloodless wall which Nature interposes in the path of the invader, to hold them temporarily until the zymogen can be made ready. Though for the moment it is an effectual barrier to the rapid proliferation and spread of the bacilli throughout the body, in a way it defeats its own purposes, for though the organism is temporarily protected from the bacillus, it is protected from the body, and behind this barrier the invaders can safely prepare their own defences, and may, in fact, enlarge their domain. If, however, any bacilli venture outside, or attempt to travel in the blood-stream, they at once succumb to the deadly zymogen which Nature has had time to prepare. The result is the same upon the tubercle bacillus as the fumes of a lyddite-shell have upon a soldier. The bacillus can only enlarge his domain by continuity, by soaking the tissues in its neighbourhood with equally deadly ferments. We know it possesses them, for life is impossible without such agents. These bacilliary ferments are not toxins.

The tubercle bacillus, destroying and devitalizing tissues as it develops, includes the local lesion we designate the tubercle. The bacillus keeps hidden behind this wall of devitalized and partly cytolized tissue, where the zymogen is not made, for sick cells cannot fight back by new manufacture. At the same time, Nature defeats her own purpose by the cytolysis and digestion of these sick cells, thus liberating in the body partly digested and toxic products to contribute

their share to the picture of tuberculous toxæmia. Nature may break down tuberculosis tissue into proteoses, but seemingly she has difficulty in reducing such to harmless amino-acids. This picture is certainly gloomy enough, but the shadows are but deepened when we reflect that even the zymogen, so potent in the destruction of bacilli, can but split them up, thus liberating their poisonous portion and completing the sad picture of tuberculous toxæmia. There is, however, a light spot in this otherwise darkened scene. Some people do recover from the disease, even when it is well established, and most master it at least once during their lives, even though in such it has not become a pathologic entity. From the foregoing it seems plain why tuberculosis is not a self-limited affection, but rather a self-perpetuating process, and I am now free to reply to the question which arises at this point—namely, How is it that some people manage to get well from tuberculosis after it has become a pathological verity with definite symtological manifestations?

The Formation of Cicatricial Tissue.

Back of the tubercle, another and more efficient wall is constructed—one which often effectually resists the poisons elaborated by the bacillus. This is a deposit of highly mineralized scar tissue. It is not as well known as it should be that Nature robs the body of lime salts to pack them into the tuberculous lung. Behind this second wall the bacillus is quite often starved to death. When this fortunate process is complete, sensitization and its result, the elaboration of the specific zymogen, which remains an active process only through continued stimulation from contact with the bacillus or its products, lessens, or is, at all events, much limited. The organism is, however, the gainer by having learned to make it once, and thus so more easily responds to the next call for its manufacture. Possibly, though, it may simply increase the quantity on demand, for the skin test shows that certain cells continue to make the specific zymogen almost indefinitely, though not always in effective quantity. If, however, it be granted—which personally I do not—that the practical immunity of six-sevenths of the human race is wholly due to the presence of this body, it must be concluded that the specific zymogen is self-perpetuating when once initiated. Without certain qualifications I cannot accept such contention. The manufacture of zymogen is a function of healthy cells, and one which only healthy cells can perform effectively; therefore good health becomes as necessary to continued immunity as the zymogen itself, for without it the elaboration of a ferment becomes impossible. Therefore as long as the body cells are healthy there is an immediate and effective response to further invasion by the tubercle bacilli.

To return to the original question, I am persuaded that there exists a very real immunity to tuberculosis, practically complete in six-sevenths of civilized peoples, and this is efficiently maintained by that body state we are still compelled to define somewhat loosely as a good vitality, and which, even in the event that a "cure" is not forthcoming, indicates the way to the final elimination of tuberculosis. This is what is meant by the often repeated statement that tuberculosis is an economic, as well as a medical, problem. I maintain that it is both. An advancing civilization should be able to remove most of the causes of devitalization, but it is also our own medical problem to aid the consumptive and find an effective vaccine against tuberculosis. Recently we have heard more of soil and less of the tuberculous seed. I think that what has already been said makes this patent to anyone. Let me illustrate: Professor Robin states that recently tuberculosis quite suddenly became very prevalent among the firemen of Paris. This epidemic was mastered, not by disinfection or elimination of the tuberculous firemen, but simply by lessening the hours of their work, and increasing their force and their pay. We may reason, then, that in the final analysis of immunity to tuberculosis, a good or a bad soil means the ability or non-ability to make the specific zymogen, plus another function of cellular vitality—a good local defence. From the foregoing, I have persuaded myself that there really is such a thing as a real immunity in tuberculosis, and, in my own mind at least, I have disposed of Dr. Trudeau's first contention.

Dr. Trudeau's second statement was that "no real immunity is possible of attainment." I might reply that six-sevenths of the people of civilized countries have already attained it; but that would not be fair, for I suspect that what he really means is that an effective vaccination against tuberculosis is impossible of attainment. Though I admit that the best vaccine must be, and always will be, good health, still, in the light of medical progress in the past fifty years, one would be rash indeed to be willing to say that no one can ever discover and isolate the specific zymogen of tuberculosis. We can certainly never expect to discover a vaccine of good health, but an entity which we know exists certainly can be discovered, and in the isolation of the zymogen for tubercle bacilli lies the solution of the vaccine of tuberculosis. Its actual isolation or separation from the cells is not necessary, if only we can get hold of it, even if combined with the cells themselves. When discovered, it might prove, like the typhoid vaccine, to be but transitory in its power; but if it were no more potent and lasting than the typhoid vaccine, it would open a wonderful vista to a tormented race of human creatures. Further, it is not even necessary to isolate the zymogen. An effective sensitizer might be more useful, and I am not certain that in the search for a sensitizer

the field offered by the tubercle bacillus and its products has been exhausted.

For the type of mind that has already unravelled the complicated mystery presented by the protein molecule, by breaking it down into its constituents, named them, and isolated them, the discovery of the tuberculosis zymogen or sensitizer should not prove an insuperable task. I think that we can safely say that an Abderhalden or an Emil Fischer of the future will accomplish it. I understand, of course, that at the present time the whole subject of ferments and enzymes is practically an unknown field; but so also, a few years back, was the subject of the chemistry of proteids which to-day is blazing with light. On so difficult a subject I hesitate to present an idea, but I cannot help feeling that in the biochemical world an analogy will be found in enzymes and zymogens to the effects of non-luminous rays in the realm of physics. I am convinced that the discoverer of the tuberculosis zymogen or sensitizer will have in his hands an effective vaccine, and it seems to me that the trail is already blazed, thus to a great extent disposing of Dr. Trudeau's second contention.

The Tuberculosis Zymogen.

This tuberculosis zymogen or sensitizer will not be a "cure" for tuberculosis. The reason is plain when we consider that nothing in all probability will ever be discovered which can penetrate the bloodless tubercle and reach the bacilli within. This brings us to the consideration of Dr. Trudeau's third statement, "that if he had his life to live over again, he would devote himself to the search for something which would kill the bacillus in the affected organism."

It is apparent to me that the good doctor's pessimism is sadly misplaced, and that if he could live and work again along the line mentioned, his last case would be worse than his first. The only really hopeful point in the field of tuberculosis prevention would be thereby abandoned, and the *ignis fatuus* of a "chemical cure" accepted. I hold that it is useless to search for that relatively harmless disinfectant of living tissues which, theoretically at least, we have excellent reason to believe does not exist. Suppose we did discover it: how could we employ it to reach the bloodless tubercle? Osmosis and surface tension have done much to improve our knowledge of matter; but it would stretch even their possibilities to the breaking-point to indicate the way to a wonderful substance which would pick out the tubercle, pass through it, killing it, and yet leaving everything else in the body undamaged.

We readily admit that the scientific position of tuberculin as a therapeutic agent is by no means established. It certainly is not a cure for tuberculosis or anything approaching it. The only possible

relation that the tubercle bacillus, or its products, can have to the cure of tuberculosis lies in the fact that Nature's defences are only called into action by the stimulation received from contact with the bacillus or its products. In the specific zymogen we can never find a cure, for if it could reach the large numbers of bacilli contained in even a small lesion, its very power and effectiveness would prove to be the undoing of the patient: the prompt splitting of the bacilli could only result in freeing the deadly toxic portion with an immediate fatal respect for the patient. Granting that the zymogen could reach the bacilli within the tubercle, which we know it cannot, its action to be curative and not deadly must needs be supplemented by something else which would unite with the toxic split-product and render it inert. Recalling for the moment the statement at the beginning of this paragraph regarding the relation of the bacillus and its products to cure, it must be remembered that thirty years of effort in tuberculosis bacteriology have served to bring forth nothing but tuberculin as a weapon against the disease. This, and nothing else of practical usefulness, has rewarded the immense effort expended, and as the leading men in the world to-day grant it a certain, even though somewhat equivocal, position, I believe we can profitably re-examine the subject of tuberculin. Dr. Trudeau himself, by an article in the *American Journal of Medical Sciences* in 1907, brought the therapeutic use of tuberculin into renewed prominence in America. He, like many another, has undoubtedly been disappointed in its action. Have we not expected too much of it? I think an affirmative reply can be made to this question without hesitation, and if we are to continue the use of tuberculin, we should have a clearer understanding as to its action and its limitations. The time has come, I hold, when we may arrive at a better understanding regarding tuberculin: to reach such a comprehension makes it necessary to start with fundamentals.

Tuberculosis Toxæmia.

What is tuberculosis toxæmia? As we have seen, dead tubercle bacilli may be introduced into the healthy animal with relative impunity; so may tuberculin, which is probably nothing more nor less than a very small portion of bacillary substances—so small, indeed, that they will pass through the finest filter that can be made. Dead bacilli and tuberculin are practically identical in their action on tuberculous animals, and the same is true of a sufficiently large dose of tubercle bacilli either living or dead. Bacillus emulsion is simply the bodies of dead tubercle bacilli which have been subjected to disorganizing chemical action. The healthy animal, not being sensitive to either tuberculin or dead bacilli, does not react to their presence; but the whole picture is at once altered if these products are injected

into a tuberculous animal. Then, when using either dead bacilli or tuberculin, parenteral digestion at once occurs, and if the dose be large enough the death of the subject results. Early work on the chemistry of the tubercle bacillus showed that it contained a nuclein portion of extremely high toxicity, not specific but general; and when by hydrolysis, Vaughan split the tubercle bacillus, he found that one portion was extremely toxic. Using either tuberculin or dead bacilli, a very deadly poison can be separated. Does it not now become plain that at least a portion of tuberculous toxæmia is due to the setting free in the sensitized tuberculous body of products of the parenteral digestion of the tubercle bacillus? Experimentally, every degree of tuberculous toxæmia may be faithfully reproduced by using varying doses of the poisonous portion of the split tubercle bacillus? Certain doses of the poisonous bacillary protein cause rapid fall of temperature in experimental animals. Certain smaller doses will reproduce every known type of fever. Taking these facts into consideration, the conclusion is warranted that tuberculous toxæmia may be, at least in part, due to the parenteral digestion of tubercle bacilli proteid. Why do we not say that it is wholly due to it? For this reason: Tuberculin will control a certain type of tuberculous toxæmia, but not all such types. Certain cases are wholly resistant to its action, even when well tolerated by the patient. I am not now thinking of the picture presented in far advanced tuberculous disease in which there is utter exhaustion of sensitizing phenomena; but of patients presenting signs of toxæmia in which sensitization is present, but in which tuberculin accomplishes nothing. From this I reason that the toxæmia of tuberculosis is compound rather than simple. It certainly is a fact that much of the evolution of the tubercle is attended by relatively large amounts of dead tissue. Nature removes this partly by expectoration, but much remains to be absorbed and parenterally digested with resulting liberation of the poisonous products and exaggeration of the toxic symptoms. It is my own opinion that the phenomena often ascribed to mixed infection are really due to this form of toxæmia. At one of the early meetings of the National Association for the Study and Prevention of Tuberculosis, I was appointed to serve on a committee investigating "Mixed Infection." As my ideas did not meet with approval, I ventured to put in a minority report. I there stated my opinion that all the symptoms ascribed to mixed infection could be accounted for by the existence of a tuberculous toxæmia alone. Time, I believe, has justified the position I then assumed. It now becomes easy to conclude that should we find a remedy for the strictly tuberculo-proteid portion of the toxæmia it will not be applicable to types due to poisoning with other proteids. When we consider these facts, it becomes plain that too much has been expected of tuberculin, even granting

that it is the specific remedy for strictly tuberculous poisoning, which some of us believe it to be.

The Justification of Tuberculin.

There is a very curious thing about tuberculin: all of us who through many years have employed it extensively have faith in it; on the contrary, those whose knowledge of it is theoretic do not believe in it. Let us examine what I conceive to be the opposing position. In the first place, the use of tuberculin has been questioned because it is not a sensitizer, and it has also been said that, if it has any good effect, it must be confined to the possible establishment of a tolerance for the tuberculo-poison. The one never-failing objection is, of course, the citation of the early Koch period, during which tuberculous people were given massive doses of tuberculin with the untoward results we know so well, and which might all have been anticipated had Koch's experiments on animals been kept in mind. We have, too, the statistical argument to deal with. It is said that we cannot prove, by means of a comparison of treated with untreated cases, that tuberculin has improved statistics. Again, the effects of reactions are cited as proof of the dangerousness of tuberculin treatment. In elaboration of this it is said that tuberculin-therapy, especially where accompanied by reactions, will mobilize the bacilli, and while the organism is under the influence of the poisoning the result of digestion or lysis of these free bacilli, such as escape destruction, have an opportunity to establish themselves in new locations of the body.

The Action of Tuberculin.

These are the principal objections to tuberculin-therapy; but before proceeding to attempt their direct refutation it seems wise at this point to explain briefly the action of tuberculin. In view of the fact that an examination of the literature will convince anyone that every expert in tuberculosis has a theory of his own, and that there is but little in accord between them all, from Sahli to Wolff-Eisner, it may seem presumptuous in me to attempt to present my own view. We still lack the absolute data necessary for the construction of a completely acceptable theory regarding the action of tuberculin. Nevertheless, enough is known, I contend, to give us something like a mental concept—one which, to say the least, is consistent with what is known. We must consider, first, that the differentiation between a chronic and acute disease lies largely in the virulence of the invading organism; how little or how intensely irritating the virus may be is also a factor. In some diseases—plague, for instance—the virulence is so great, the toxæmia so lethal, that only an insignificant portion of the subjects attacked recover. In such cases, however, recovery is relatively rapid

when it does occur. Acuteness means an organism which grows rapidly in the tissues, which at a certain point is no less rapidly split, with sudden development of the toxæmia, and Nature must get ready her antibodies in a hurry or she will be too late, and so she makes them under extreme provocation. She usually manufactures enough to eradicate the disease completely, both of enzyme and amboceptor. Chronicity is the opposite of all this.

In the acute affections more commonly known to us—typhoid fever, for instance—the irritation supplied by the typhoid bacillus or the products of its digestion is always sufficient to maintain the defensive ferment of the body in a state of activity. On the contrary, in tuberculosis and in certain other chronic bacterial diseases, Nature is too prone to take a nap—witness the lack of inflammatory response when a healthy animal is inoculated with living tubercle bacilli, which, if present at all, is characterized by its sluggishness. As the irritation is not great, sensitization proceeds slowly, spreading gradually from the lesion toward the periphery, and to be efficiently maintained it requires constant contact with the bacillus or its products, which in tuberculosis is often wholly or relatively absent over somewhat long periods. Chemotactic leukocytosis, so essential as a part of the defence mechanism of the body, is very imperfect in tuberculosis. In this disease we can liken the invaders to treacherous spies in a peaceful and unsuspecting country, the inhabitants of which are not aware of their presence. If they were it would be easy work to expel or destroy them. In tuberculosis the bacilli are usually very slightly irritating in their beginning, and the disease is unpretentious in its early manifestations, and hidden in the tubercle the bacilli can go about their fell business without attracting undue attention to themselves. Meanwhile the body politic becomes gradually conscious that an enemy is in its midst, and too late, in many instances, prepares its defences; for as soon as the tubercle is complete the bacilli are adequately protected for the time being. If any now escape they are most likely destroyed. If Nature would just keep her soldiers, guns and fortifications and commissary in order, all would go well, and the bacilli would starve to death in their citadel; but like most great bodies, the cellular host go back to their own particular business as soon as what seems to be a trifling affair is disposed of, and the one great and potent weapon—the specific zymogen—disappears. From time to time a few still viable bacilli make their escape and succeed in establishing themselves in new locations, and each time this process is repeated the bacillary enemy is repelled but not annihilated, and there results the gradual accumulation of the débris of battle, the wasting of the country, and finally, the exhaustion of the defences. So the bacilli, which are never all asleep at the same time, become the masters of the situation.

Defensive processes against infection are mostly of the nature of fermentations. The accumulation of fermentation products, as is well known, always in the end arrests the fermentation, and so in tuberculosis sensitization finally fails. Thus is explained the chronicity and usually fatal outcome in well-established tuberculous disease. At this point it may well be asked, Where does tuberculin come in? It is a bacilliary protein, nothing more nor less, and, unlike Nature, we can administer it in certain doses and keep it persistently in action. We then apply the stimulus which keeps the defences of the body, and, in particular, the specific zymogen, in a state of preparedness and activity long enough to permit fibrosis and calcification to work the starvation of the bacilli and the cure of the disease. Right here is the point to lay emphasis on the absurdity of trying to reach enormous doses. Too many still think there is such a thing as a course of tuberculin, aiming at giving a thousand milligrammes to a patient. It should be the maintenance of an effective dose that we are after, not the gradual accumulation of fermentation products so that a desirable termination is defeated by the arrest of fermentation, and consequently, of sensitization. We must maintain sensitization at the highest possible point, and do nothing that will impede or stop it. Far advanced consumptives have lost their sensitiveness, but they are not cured, unless death be conceived and counted as a cure.

Such is my interpretation of the action of tuberculin. I will be perfectly frank, and admit that, so far as I know, no one else has advanced a similar hypothesis, and I recommend its acceptance with reservations. Perhaps I can make myself plainer by stating that I believe tuberculin to be a force applied from without, and the fact that in some cases it will not bring about toxic immunity is capable of two explanations: First, as already seen, the toxic split product of the bacillus is not the sole element in the toxæmia; and second, in some cases the immune machinery is so far broken, or even lacking from the beginning, that the smallest amount of liberated toxic substance cannot be tolerated or neutralized. Then the defending soldiers are so cowardly or so few that the organism is relatively or completely incapable of responding to force, and tuberculin in such cases simply adds to the toxic state. Under such conditions it is exactly analogous to the tuberculo-poison itself; as an immunizing substance, or as an activator of sensitization, it has nothing at all to recommend it. A complete analogue of the use of tuberculin in the face of hypersusceptibility may be found in what sometimes occurs naturally when Nature herself permits the escape of enormous numbers of bacilli into the circulation at one time, with resulting sudden death from allergy. The action of tuberculin is capable of another explanation—namely, that it is an antigen. When introduced into the sensitized body, it is

split, as we have already seen, and according to my theory sensitization is maintained by giving it pabulum upon which to feed. Not only is this accomplished, but the poisonous split portion must be dealt with, and this is probably the case either by carrying its digestion to the state of a harmless amino-acid, which can be synthesized by the body, or else by combining it in such a way as to render it harmless. It is well known that animals can be accustomed to increasing doses of protein poisons.

My explanation regarding the action and use of tuberculin would not be complete without a reference to the well-known chemotactic leukocytosis, which follows its introduction into the tuberculous body, thus bringing the leucocyte and its ferments where they can do the most good—namely, to the focus of the disease—and where they have little or no tendency to go naturally in tuberculosis. In fact, the bacterial aggressins actually keep them away. It is probable that at least some of the good effects of tuberculin are due to this action, especially in cases where benefit follows a focal reaction.

From the foregoing explanation of the action of tuberculin we can find the refutation of the arguments against its use. The first objection that it is not a sensitizer is about as wise as saying that we should not use a bicycle because it is not an automobile. No one regrets more than I that it is not a sensitizer—at least, judged according to any ordinary understanding of what a sensitizer is. So far the living bacillus is the only efficient sensitizer we know, and a whole line of experiments from those of Koch and von Behring to those of Webb prove conclusively that it cannot be used successfully for this purpose. So we cannot well blame tuberculin for not being something else than what it is. With Victor Vaughan's statement that its only possible good effects must be due to the fact that it induces the establishment of a tolerance for the tubercle poison I have little patience; for tuberculin is not the tuberculo-poison which is toxic for both healthy and diseased animals. To become such it must first be acted upon by the ferment of the diseased animal. The only way it can contribute to tolerance is by being an antigen. Regarding the early Koch period, it is not my business to act as its apologist, but simply to say that the failure of tuberculin when abused is not an argument against its proper use. We understand tuberculin now, then we did not, though a little reflection from the then known facts might have saved a lot of trouble.

Next in line is the statistical argument. I am not able to understand tuberculin enthusiasm any better than I can tuberculin depreciation. The contentions of Dr. Noel Bardswell and Dr. Carmac Wilkinson are equally incomprehensible to me. One, the latter, with a large book proves that tuberculin is quite wonderful, and will eventually replace all sanatoria by rendering them unnecessary. The other,

the former, in a smaller book proves that it is useless. Both, I think, are equally mistaken. Therapeutic conviction is often too elusive to be a matter of statistics, especially in dealing with a disease the phenomena of which are so varied as is true of tuberculosis, and, I might add, so difficult of classification. Dr. Trudeau has proved that in end-results the tuberculin-treated cases show up best. It is certainly true that every man who has used tuberculin extensively over long periods believes in it, and this includes most of the eminent tuberculosis workers of the world at the present time, from Sir Robert Philip to Sahli and Turban.

We must all grant that, even though reactions sometimes do good—I have seen great improvement, and sometimes immediate cure, follow them—in the long-run they will do infinitely more harm than good, and therefore must always be avoided as far as is possible. Slight reactions are harmless; it is their repetition that is dangerous. A skilful worker will not have any trouble from this source. I sometimes go a year without seeing anything like a definite reaction among my patients.

Leaving the objections to the use of tuberculin, it may be asked, What do we witness practically that can be ascribed as beneficial from its use? What are its clinical effects? If one must have tuberculosis, a good toxic immunity is the best accompaniment one can have. Such a desirable body state in which, notwithstanding that the patient is a bacillus-carrier, the condition is normal in every other respect, is often encountered in tuberculous disease. When this most desirable status is maintained long enough, what may justifiably be designated "cure" is in sight, and there is less necessity for tuberculin or any other medication than at almost any other time or stage. This happy condition is due to two factors, either of which may be operative. The first is such a condition of the lesion that for the time being it is isolated from the rest of the body—thus tubercle and other poisonous substances do not reach the circulation; and, second, if tubercle or other toxic matter reaches the circulation, it is first split and then either neutralized or completely digested. In short, all the defences are alert and ready for business. Unfortunately, this is not the picture most often observed, but, on the contrary, the patients exhibit some or all of the symptoms of chronic intoxication. Second to rest, food, clean air, and the metabolic alternative found in high climates, and second to them alone, tuberculin remains, I believe, the most potent weapon for reaching the intoxication, and sometimes it succeeds when all other agents fail. This applies to persistent febrile states with especial emphasis.

Tuberculin, in the hands of a master, is most potent in its ability to bring about a normal temperature, when the fever is the result of

simple tuberculo-poisoning, and not due to compound intoxication. Instances are frequent in my practice in which I have succeeded with tuberculin in bringing the temperature down to normal when a fever of from 99·3° to 100° F. has characterized the previous three or four years of the patient's life. As one grows older in this work one meets with patients who have been under observation five, ten, and even fifteen years. It is no unusual experience for such to come to me and state that they need more tuberculin. By means of tuberculin there are people who are rescued not once, but over and over again, from a premature death. Indeed, some must have tuberculin off and on for years if they are to remain alive. Dr. William Charles White, of Pittsburg, is such a case, and I have heard him state that whenever he does not feel well, or arises tired, he finds an unfailing refuge in tuberculin. It can be proved statistically that in any institution where tuberculin is scientifically employed, there are fewer tuberculous complications or extensions of the lesion. In fact, Bandelier and Roepke say that an institution where tuberculin is used may be distinguished from one where it is not used by simply counting the number of patients in bed, the smaller proportion confined to bed being characteristic of the institution employing tuberculin. I duplicated such an experience a number of years ago, when I stopped the use of tuberculin for the purpose of observing the results of its non-use. I intended to do without it at least for six months, but I was forced to take cover at the end of three.

If we conceive tuberculosis as composing a vicious circle, I have no difficulty in concluding that by means of tuberculin we can often break the enchanted ring that surrounds the tubercle bacillus, or rather with which he has surrounded himself through ages of successful parasitism. In conclusion, I can only regret that I find myself unable to agree with my master, Dr. Trudeau; but if I could visit him and find him in a happier mood, I have little doubt that we could reconcile our differences in a few moments.

INSTITUTIONS FOR THE TUBERCULOUS.

THE ROMSLEY HILL SANATORIUM, NEAR BIRMINGHAM.

THE following description of the Birmingham Hospital Saturday Fund's Home for Consumptives on Romsley Hill, known as the Sir William Cook Memorial, has been supplied at our request by the Honorary Secretary, Mr. W. S. Aston.

The Romsley Hill Home for Consumptives was started as a Public Memorial to the late Sir William Cook, who for the long

THE ROMSLEY HILL SANATORIUM, NEAR BIRMINGHAM.

period of thirty years was Chairman of the Birmingham City Health Committee, and also of the Birmingham Hospital Saturday Fund. This Fund is one of the most successful in the kingdom, raising £23,000 annually from the men and women working in the manufacturing and industrial establishments of the city. It was the pioneer, twenty-three years ago, in the establishment of self-supporting convalescent homes for men, women, and children, through which nearly 50,000 patients have since passed. The maintenance of these homes is provided for after distributing £10,000 annually amongst the Birmingham hospitals. The need for a home for consumptives had long

been felt, and five years ago the scheme took shape and the site was secured on the southern slope of Romsley Hill, ten miles out of Birmingham. The first plans were for sixty beds. The scheme provided under the Insurance Act caused the Committee to make provision for 110 beds, and the Home was in this connection brought under the Birmingham Tuberculosis Scheme, although it still remains the property of the Birmingham Hospital Saturday Fund, and is managed entirely by their Committee. The adjoining town of Smethwick also shares the beds at Romsley Hill, taking twenty beds as compared with Birmingham's ninety. The site, buildings, and equipment are considered to be excellent, and so far the patients have done exceedingly well there. The Medical Superintendent is Dr. Peter Allan, who obtained his experience in the treatment of tuberculosis under Sir Robert Philip at the Royal Victoria Hospital, Edinburgh.

NOTICES OF BOOKS.

DEFECTIVE CHILDREN.

Defective children have for some years been receiving increasing attention, and a useful collection of representative studies by well-known experts has just been issued under the editorship of Dr. T. N. Kelynack. The volume is simply entitled "Defective Children."[1] The reader must not be misled by the title. I took the work up supposing that I was to find it dealing with the feeble-minded only, whereas it embraces more or less every form of defection from the normal standard of health in childhood. It is, of course, impossible to review a book comprising such an extent of subjects in any real sense—that is, criticize it—and even in singling out special articles there is a danger of selecting those that most interest the writer at the expense of those that do not so much attract him, so I shall content myself with saying in general that I have read it throughout, and most of the articles are juicy and interesting. Indeed, in all quite a number of points arrest attention. For instance, in the chapter on "Idiots and Imbeciles," the true remark is made that a too favourable prognosis is often given of the cretin, because of the good effect that thyroid extract has upon the cretinous state; but most cretins are idiots, and the remedy seldom brings them up to a normal standard. In treating of the epileptic child, one wonders if too much has not been made of *congenital amentia*, as against the ill-effects of injury, during the labour, of the nature of a birth palsy; and personally I should have liked to see convulsions more closely linked up with epilepsy. For what is epilepsy? Is it more than convulsion stereotyped into a habit? In the article on criminal children, allusion is made to the work of Miss Dendy for the feeble-minded, a work to which she has devoted her life, and which has of late been properly recognized by the State in appointing her one of the first Commissioners under the new Act. One may note, too, the interesting remark that hypnotic suggestion appears to have done good in some cases. Paralytic cripples are, it seems to me, rather well sorted into spastic or cerebral cases, and flaccid or spinal and muscular paralyses. This is simple, and not far off the truth. Of tuberculous cripples, it is said that a chalky district, with hard drinking-water, is frequently advantageous. Much that is interesting, too, is to be found in the article upon cardio-vascular defects in children; and an article upon defective *growth* and *development* is all too short, for it is so good. The deaf child, poor mite, seems to be a hard nut to crack from whatever standpoint it is viewed, for, saving the defect that comes of adenoids, there seems little more to be done for them educationally than can be arranged by remedial treatment. Much is summed up by saying that many congenitally deaf children are weak-minded, and for them nothing,

[1] "Defective Children." Edited by T. N. Kelynack, M.D. Pp. xvi+462. London: John Bale, Sons and Danielsson, Ltd., 83–91, Great Titchfield Street, W. 1915. Price 7s. 6d. net.

or not much, can be done, and they should be prevented from marrying, lest they perpetuate their disabilities. When this is not so, the deaf child must be taught lip-reading, and, fortunately, this extends their outlook in a most substantial way. Both deafness and mutism are ascribed largely to early meningitis. The later chapters concern themselves with defective boys and girls in secondary schools, and the information given seems to show that the attention bestowed upon the child in the primary school leaves comparatively little to complain of in the secondary. School and dental clinics and open-air schools for defectives come next, the latter paper raising the thought: Why not for all children in some sane proportion? Open air is an excellent thing; but it seems to be often forgotten that the old adage, "Cleanliness is next to godliness," is not a latter-day order of sanitation. Animal heat comes a long way first—that is, food and clothing—cleanliness comes some time later, and godliness or education is a good way down. Who was it that made the remark that, if one wishes to live in a well-ventilated room in our climate, it is necessary to sit with a greatcoat on for many months in the year? and this fact is the great opponent of the gospel of the open window. Food, clothing, and coal, are its prime wardens. The latest sections deal with, perhaps, the most interesting subject of all: How defectives are dealt with in other parts of the world —Scotland, Ireland, Canada, the United States, France, Germany, Hungary. It would appear that in most countries fairly complete regulations now exist for dealing with defective children, but, naturally, it is a subject that can be dealt with in a volume such as this in the merest outline. On the whole this is a really useful book, if only it finds its way into the hands of medical advisers and educationists who are interested in the questions with which it concerns itself; but experience would, I think, suggest that the information herein contained is more likely to be sought for in special works than in one where one can hardly say beforehand what it contains. The volume is dedicated to Sir George Newman, M.D., Chief Medical Officer of the Board of Education, and it will probably be of chief value to those engaged in work in connection with our national school medical service.

(Sir) James F. Goodhart, M.D.

A CAMPAIGN AGAINST CONSUMPTION.

Under the above designation Dr. Arthur Ransome has collected a number of studies which he has prepared between 1881 and now, and which have been presented to various scientific bodies, or have appeared from time to time in well-known journals.[1] The author is a veteran pioneer in the anti-tuberculosis conflict, and has served for fifty years and more as a reliable leader. Dr. Ransome claims that he entered the campaign against consumption as far back as 1860. The first of his more militant efforts was a Health Lecture on "Foul Air and Lung Disease," published by the Manchester and Salford Sanitary Association

[1] "A Campaign against Consumption: A Collection of Papers relating to Tuberculosis." By Arthur Ransome, M.D., F.R.C.P., F.R.S., Hon. Fellow of Caius College, Cambridge; Consulting Physician to the Manchester Hospital for Consumption and to the Bournemouth Hospital; late Professor of Public Health to Victoria University of Manchester. Pp. x+263, with six charts. Cambridge: University Press. 1915. Price 10s. 6d. net.

in 1876. The present volume opens with another Health Lecture on "Consumption: Its Causes and Prevention," first published in 1881, just before the discovery of the tubercle bacillus by Koch. The book contains twenty-two papers, grouped under the following four sections: General; Conditions of Infection; Researches; and Chiefly Statistical. The articles cover much ground, as is sufficiently indicated by the following titles: The Need of a Standard of Efficient Ventilation in all Workplaces and Places of Public Assembly; Duties of the State in Regard to Tuberculosis; The Need of Co-ordination of Anti-Tuberculosis Measures; On the Limits of Infection by Phthisis; The Susceptibility of Tuberculosis under Different Conditions; On Certain Bodily Conditions resisting Phthisis; On Intrapulmonary Injections; On Reinfection in Phthisis; The Tubercle Bacillus as a Saprophyte; Some Evidence respecting Tuberculous Infective Areas; Tuberculosis and Leprosy: A Parallel and a Prophecy; The Prospect of Abolishing Tuberculosis; The Public-House as a Source of Phthisis; Phthisis-Rates: Their Significance and their Teaching. Among so much material of first-class importance it is impossible to differentiate. The book is one which provides something of a record of the evolution of thought, and a review of the progress of action in regard to matters relating to the causation and arrest of pulmonary tuberculosis. It is a book which we would commend to the study of medical officers of health, and particularly to the newly appointed tuberculosis officers, who in their enthusiasm for the application of present-day conceptions are too apt to neglect the history and lessons of the past. Dr. Ransome's old students and many friends will be glad to welcome this volume as evidence of the keen interest and desire for practical service which still impels this veteran to continue to do his bit in these days of national anxiety and urgent need.

TUBERCULOSIS SCHEMES.

Many and varied schemes have been suggested, and some few have been effectively organized and are being more or less satisfactorily administered. In most cases these schemes are far from having a reliable scientific basis, and in perhaps the majority of instances are the outcome of considerations in which expediency, compromise, and economic and other limitations, have exercised considerable influence. Dr. Barty King has for two years or more devoted much pains to the elaboration of a comprehensive and ideal scheme for the conduct of tuberculosis work in the Metropolis.[1] Sir William Osler, in his luminous foreword, rightly insists that the problem is a medico-sociological one. "On paper the problem looks simple—To put all in healthy environments, with good housing and proper food, which are the essential preliminaries to healthy habits. To recognize the disease early and to put the patients in the best possible circumstances to

[1] "Scheme for Dealing with Tuberculous Persons in the County of London: Its Application to Other Cities, with Some Observations on the National Organization of the Campaign against Tuberculosis." By D. Barty King, M.A., M.D. Edin., M.R.C.P. Lond. and Edin. With a Foreword by Professor Sir William Osler, Bart., M.D., F.R.C.P., F.R.S. Pp. xi+54 and xv charts. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1915. Price 5s. net.

promote cure. And to guard the community against dangers associated with advanced incurable cases. The first is a basic economic question; rehousing will take at least a couple of generations. An abundant supply of good food means better wages, and a stricter protection against external contamination. The second is met by efficient home treatment, and by the hospitals, dispensaries, and sanatoria. The third by the closer supervision of dangerous cases, and better provision for their segregation." Dr. Barty King's monograph is an able exposition of the advantages of co-ordination. He urges that both on medical and economic grounds the prevention of tuberculosis is better than its cure, and, further, that one case of pulmonary tuberculosis overlooked or neglected may mean sickness, disablement, loss of employment, and death, to many. He recognizes the vital importance of an intimate relation and co-operation between the Public Health Authority, acting through its Medical Officer of Health, and the various units of the scheme, more especially the tuberculosis dispensary, and that the tuberculosis officer shall be an official of the Public Health Authority, although clinically independent. It is claimed that the core of the scheme lies in the provision made for the greatest possible number of centres for the examination of tuberculous cases. The scheme provides for the utilization of existing institutions, and for the establishment of a tuberculosis dispensary in connection with a general or chest hospital. It approves tuberculosis dispensaries as "pivots" for diagnosis, and in certain cases for treatment as well as for the transference of cases from one district to another. One of the outstanding merits of the scheme is that it arranges for insured and uninsured cases to be dealt with in one comprehensive organization. The establishment of a central bureau, with medical referees, is viewed as essential. The importance of measures for the segregation of advanced cases is insisted on. Throughout the scheme aims to secure the loyal co-operation of voluntary agencies, which are seen to be essential to the welfare of both insured and uninsured patients. The details of the scheme are set forth in orderly array and in explicit language. We are particularly glad to find that Dr. Barty King has given special attention to the needs of tuberculous children. The scheme of the London County Council is submitted to judicious criticism. Perhaps the most important and valuable feature of the monograph is the admirable series of elaborate charts which diagrammatically express the chief points advocated in the scheme. The work is a valuable contribution to the practical organization and administration of measures striving, not only for the arrest of tuberculosis, but the restoration and assistance of the tuberculous. We earnestly recommend Dr. Barty King's monograph to all Medical Officers of Health, tuberculosis officers, school medical officers, members of Insurance Committees, and all seeking to establish economic and effective measures for scientifically coping with the tuberculosis problem. A word of praise is due to the publishers for the excellent manner in which the text and charts have been prepared.

TUBERCULOUS CRIPPLES.

The recently issued study of Crippled Children in the United States of America, prepared through the bounty of the Russell Sage Foundation, is a work which merits the thoughtful study of all interested in

the care and education of children crippled by tuberculous and other diseases on both sides of the Atlantic.[1] The work is an able exposition of the whole case for crippled children. The need for special provision for the physical care and intellectual training of these handicapped lives is forcibly presented. Particulars are given regarding forms of handwork and vocational training suitable for this class of case. Statistical data are presented with descriptions of the various institutions available in the United States. For all undertaking the organization of medico-educational work among cripples, the work will be of the greatest assistance. Much useful information is provided regarding tuberculous cripples. "The search for pure air as one of the necessary elements for the strengthening of tuberculous children has been the chief factor in causing some city institutions to move to country locations or to establish country branches. Others which have not changed the location of their plant send as many as possible of their patients to fresh-air homes or to special summer homes for crippled children during the hot months. Some surgeons believe that there is special benefit for tuberculous children in sea-air. . . . More recently there has been considerable discussion of the value of sunshine for sick children, especially tuberculous children. In several places in Europe, particularly in Switzerland, children with tuberculous sinuses are exposed to the direct rays of the sun, and the surgeons state that the sinuses have healed with unprecedented rapidity." It is interesting to see how the problems of medical and surgical care are necessarily closely related to those dealing with vocational training: "The vocational problem is being greatly simplified by the rapid advances made in orthopedic treatment. The urgent importance of applying orthopedic treatment in the earliest stages of the disease is being emphasized, and as a result there has been a great diminution of the average age of children in some of the best orthopedic hospitals. The aim now is to get the child very young, and to cure him and restore him to his natural environment before he is old enough to receive any vocational training whatever. The child being restored to health, even though he may be somewhat lame, is able to work out his own vocational problem." Particulars are given of Sea Breeze Hospital at Coney Island, and of other institutions for tuberculous cripples. The value of the book is much enhanced by the numerous and excellent illustrations and plans.

THE USE OF TUBERCULIN.

Much discussion has taken place regarding the value of tuberculin in the treatment of tuberculous disease, and it cannot be denied that in many quarters tuberculin is falling into disfavour. There are, however, some who hold that in properly selected cases it may prove a valuable adjunct to hygienic measures. Major A. W. R. Cochrane and Major C. A. Sprawson have just issued a manual which they have

[1] "Care and Education of Crippled Children in the United States." By Edith Reeves, Special Agent, Department of Child-Helping, Russell Sage Foundation. With an Introduction by Hastings H. Heart, LL.D., Director, Department of Child-Helping. Pp. xi+252, with illustrations and plans. New York: Survey Associates, Inc., 105, East 22nd Street. 1914. Price $2.

written specially for the guidance of the busy medical practitioner.[1] It seeks to enunciate rules for the administration of tuberculin, with directions regarding the estimation of dose according to the sensitivity of the patient. The scope of the book may be best indicated by an enumeration of its chapter headings: The Rôle of Tuberculin; Choice of Tuberculin and Nomenclature employed; Technique; The Tuberculin Reaction; A Working Hypothesis of the Action of Tuberculin; General Principles of Dosage; Estimation of the Dose; Tuberculin in Diagnosis; Pulmonary Tuberculosis in Children; Contra-Indications to Tuberculin Treatment; Tuberculin in Tuberculosis Other than Pulmonary. The manual will be of practical service to those for whom it has been prepared.

TUBERCULOSIS NURSES.

Tuberculosis nurses now occupy a recognized place in the Anti-Tuberculosis Campaign. If they are to accomplish the responsible duties which devolve upon them, they must receive effective training. Every sanatorium of any size and status should be organized and administered, not only as a hygienic training centre for patients, but as an efficient training school for nurses. Dr. Burra's new work might well serve as a manual for such.[2] It is based on a course of lectures delivered by the author to nurses engaged in district work. In compact form, concise but lucid language, and with a full realization of the practical needs of nurses and all classes engaged in tuberculosis work.

FLIES AND DISEASE.

For some time professional opinion has marked out flies as being carriers of certain forms of disease. And now the time has arrived for a serious campaign against these enemies of human welfare. As part of the movement, the Zoological Society of London has instituted an exhibition in the well-known Zoological Gardens in Regent's Park.[3] Professor H. Maxwell Lefroy has also prepared an illustrated popular brochure.[4] The publishers of *The Medical Officer* are also providing

[1] "A Guide to the Use of Tuberculin." By Archer W. R. Cochrane, M.B., F.R.C.S., Major, Indian Medical Service; Medical Superintendent, King Edward VII. Memorial Sanatorium, Bhowali, United Provinces; and Cuthbert A. Sprawson, M.D., B.S., M.R.C.P., Major, Indian Medical Service; Professor of Medicine, King George's Medical College, Lucknow; and Physician to King George's Hospital and to the Lucknow Tuberculosis Hospital. Pp. vii + 181. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1915. Price 5s. net.

[2] "A Practical Manual of Tuberculosis for Nurses," By L. T. Burra, M.D. (Oxon.), Tuberculosis Officer to Bucks County Council, late Assistant Medical Officer to King Edward VII. Sanatorium, and Medical Superintendent, Royal National Hospital for Consumption for Ireland. Pp. xv + 135. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1915. Price 2s. net.

[3] The Exhibition in connection with the House-Fly Campaign is situated in the grounds of the Zoological Society of London, and is open to the public.

[4] "The House-Fly Campaign." By Professor H. Maxwell Lefroy, M.A., F.Z.S. Pp. 16. With illustrations of the Blowfly and Fly-traps. Published by the Zoological Society of London, and sold at its house in Regent's Park, London, N.W. May, 1915. Price 2d.; post free, 2½d.

suitable pamphlets for distribution to the general public.[1] The Cambridge University Press have done incalculable service by the issue of a number of valuable monographs dealing with the life-history of various forms of flies. A second edition has recently been issued of Dr. G. S. Graham-Smith's authoritative work on "Non-Bloodsucking Flies."[2] This standard volume should be available for all doctors, teachers, administrators, and members of public health and hygiene committees. It provides in scientific but interesting form an up-to-date exposition of our present knowledge in regard to the relation of non-bloodsucking flies to disease. The work of Manson, Bruce, Ross, and others, has conclusively demonstrated the parts played by blood-sucking flies, but until recently too little attention has been paid to the pathogenic influence of the non-biting flies. Now, however, the work of Hewitt, Austen, Newstead, and certain entomologists in America, has enlightened our ignorance. We now know, as Dr. Graham-Smith summarizes, "that many of the non-biting flies found in houses frequently walk over and feed on decaying substances and excreta of all kinds, and that their larvæ develop in them; that occasionally disease-producing bacteria may be present in these excreta; that flies can carry bacteria on their limbs and bodies for several hours, and internally for several days; that for some days they can infect substances, including human food materials, over which they walk or defæcate, and on which they feed; and that their habits are such that they constantly infect food with the bacteria they carry. Further, the epidemiological evidence suggests that, when suitable conditions prevail, flies may be highly important factors in the spread of certain infectious diseases." Dr. Graham-Smith's work collects and effectively tabulates all the various facts and hypotheses which relate to the life-histories, habits, and disease-carrying potentialities, of non-bloodsucking flies. A chapter is devoted to the consideration of the influence of these flies in the spread of tuberculosis. Here is the summary: "In making observations on 'wild' flies, it must be remembered that acid-fast bacilli closely simulating *B. tuberculosis* are frequently present in milk and other substances, and consequently may be found in flies. The nature of these bacilli can only be proved by animal inoculations. The experiments quoted, however, conclusively indicate that flies may carry *B. tuberculosis* and distribute it for several days after feeding on infected material. No doubt under suitable conditions they frequently infect articles of food, and in the rooms of phthisical patients may infect the food daily. In the production of tuberculosis the influence of dose, especially the initial dose, is probably a most important factor, and in most cases the number of bacilli deposited cannot be very great. Only the actual number of bacilli deposited are ingested with the food, since even under the most suitable conditions these bacilli multiply very slowly. In this connection, however, the fact that flies feeding on sputum suffer from diarrhœa may be of some importance. The experimental evidence clearly proves the desirability of protecting sputum

[1] Specimens of the leaflets, etc., for distribution may be obtained on application to the publishers of *The Medical Officer*, 36-38, Whitefriars Street, Fleet Street, London, E.C.

[2] "Flies in Relation to Disease: Non-Bloodsucking Flies." By G. S. Graham-Smith, M.D., University Lecturer in Hygiene, Cambridge. Pp. xvi+389, with illustrations. Second edition. Cambridge: John Clay, M.A., the University Press. 1914. Price 12s. 6d. net.

from flies, which, according to all observers, are greatly attracted to it; but in considering their relation to infection in the human subject the influence of dose must be taken into consideration." The companion volume by Dr. Edward Hindle deals with Bloodsucking Flies,[1] and thus the two volumes practically cover the whole field of flies and disease. Dr. Hindle's monograph opens with an intensely interesting general introduction, in which the problem is outlined in all its aspects. Then follow chapters on the structure and classification of the Diptera, together with a tabular list of all biting flies known to transmit infection. Each family is then described and dealt with in detail. The work is marked throughout by a thoroughness and painstaking care which calls for highest praise. At the end of each section are references. There are also illustrations and a good index. In conclusion, it should be added that the monographs of Dr. Graham-Smith and Dr. Hindle are volumes of the admirable "Cambridge Public Health Series," which are being issued under the general editorship of Dr. G. S. Graham-Smith and Mr. J. E. Purvis.

MANUALS FOR MEDICAL ADVISERS AND WORKS OF REFERENCE.

Tuberculosis officers, and, indeed, all medical practitioners, are constantly being called upon to deal with misrepresentations of "anti-vivisectionists." For a detailed exposition of the aims and methods of this class of opponents of truth and obstructors to the progress of humanity, and for a particularly able statement regarding knowledge resulting from experiments on animals, we commend the recently published work of Professor W. W. Keen, of Philadelphia.[2] The volume consists of a series of essays, arranged in chronological order, which the author has published since 1885. They deal with all aspects of the subject, special prominence being given to the misstatements of anti-vivisectionists, as well as to the debt we owe to experimental research. The question of tuberculosis, and also the introduction and use of tuberculin, are of course dealt with. It is stated that "in thirty years the sixteen British anti-vivisection societies have received more than £100,000"—would that this sum could have been devoted to the inadequately supported anti-tuberculosis campaign! This volume is written mainly to provide a righteous medical defence for scientific workers in America; but Professor Keen by the issue of his notable book has laid all medical practitioners under a deep debt of gratitude. Every doctor and truth-seeking man and woman should read this informing collection of studies.

Dr. E. R. Hayhurst, of the Ohio State Board of Health, has prepared a comprehensive report on industries and occupations in relation

[1] "Flies in Relation to Disease: Bloodsucking Flies." By Edward Hindle, B.A., Ph.D., Assistant to the Quick Professor of Biology, Cambridge. Pp. xvi + 398, with illustrations. Cambridge: John Clay, M.A., the University Press. 1914. Price 12s. 6d. net.

[2] "Annual Experimentation and Medical Progress." By William Williams Keen, M.D., LL.D., Professor Emeritus of Surgery, Jefferson Medical College, Philadelphia. With an Introduction by Charles W. Eliot, LL.D., President Emeritus of Harvard University. Pp. xxvi + 312. Boston and New York: Houghton Mifflin Company. London: Constable and Co., Ltd., 10, Orange Street, Leicester Square, W.C. 1914. Price 7s. 6d. net.

to disease.[1] The volume is one of the most complete, up-to-date, and generally informing monographs ever published on the subject. Although of chief interest to American administrators, it will well repay careful study by all students of medico-sociological problems. Almost all forms of industry seem to have been dealt with. The relation of tuberculosis to occupation receives full consideration. The volume is plentifully illustrated, and a very complete index has been provided.

Dr. R. Prosser White's monograph on trade processes and agents giving rise to derangements of the skin[2] is not only a highly interesting and informing work, but contains much that will be of service to the general practitioner. It is a book which we would strongly commend to the attention of medical superintendents of hospitals and sanatoria dealing with working-class patients, or employing various occupations as therapeutic and educational measures. After a lucid exposition of the general features of occupational dermatitis, detailed descriptions are given of the various lesions produced by trades, chemicals, and processes. Space is devoted to the consideration of the action of petroleum and tar distillates and aniline. There is an excellent section on Dermatitis Venenata, and the concluding chapter deals with what is designated "Zoetic Dermopathy." Great care has been taken to make the book thoroughly representative and practical. Almost every page bears references to the literature of the subject, and there is a serviceable index.

Dr. H. R. M. Landis and Miss Jamie S. Reed have prepared a valuable illustrated report regarding Factors affecting the Health of Garment Makers, which is issued as the Eighth Report of the Henry Phipps Institute.[3] The work is a valuable contribution to the medico-sociological study of industries carried on under non-hygienic conditions.

The thirty-third issue of the *Medical Annual*[4] has just been published, and fully maintains its size, interest, and up-to-dateness, an achievement in these war days of which editor and publishers may well be proud. There are well over a thousand pages; thirty-two names appear in the List of Contributors; the customary form and arrangement is continued; the work, in short, abundantly justifying its claim to be "A Year-Book of Treatment and Practitioner's Index." The illustrations are numerous and instructive. The General Index covers thirty-

[1] "A Survey of Industrial Health-Hazards and Occupational Diseases in Ohio." By E. R. Hayhurst, A.M., M.D., Director, Division of Occupational Diseases. Pp. xviii+438, with 101 illustrations. Issued under the general supervision and direction of the Ohio State Board of Health, E. F. McCampbell, Ph.D., M.D., Secretary and Executive Officer, Columbus, Ohio, U.S.A. The F. J. Heer Printing Company. 1915.

[2] "Occupational Affections of the Skin: A Brief Account of the Trade Processes and Agents which give rise to them." By R. Prosser White, M.D., M.R.C.S., Senior Physician and Dermatologist, Royal Albert Edward Infirmary, Wigan. Pp. x+165. London: H. K. Lewis, 136, Gower Street, W.C. 1915. Price 7s. 6d. net.

[3] University of Pennsylvania—Eighth Report of the Henry Phipps Institute for the Study, Treatment, and Prevention, of Tuberculosis: Factors affecting the Health of Garment-Makers. By H. R. M. Landis, M.D., Director of the Clinical and Sociological Departments; and Jamie S. Reed, Research Assistant in Sociology. Pp. 104, with illustrations. Published by the Henry Phipps Institute, Seventh and Lombard Streets, Philadelphia, U.S.A. 1915.

[4] "The Medical Annual: A Year-Book of Treatment and Practitioner's Index." Pp. cxx+961, with plates and illustrations. Bristol: John Wright and Sons, Ltd. 1915. Price 10s. net.

four double-column pages. Dr. Frederick Langmead deals with Tuberculosis in Children; Dr. Herbert French has a brief paragraph on Generalized Tuberculosis; Mr. J. W. Thomson Walker writes on Genital Tuberculosis; Dr. J. J. Perkins has a lengthy survey of articles dealing with Pulmonary Tuberculosis; and Mr. F. W. Goyder provides a section on recent work relating to Surgical Tuberculosis. Dr. O. C. Gruner contributes a particularly able résumé of work relating to the Clinical Pathology of Blood, illustrated by excellent coloured plates; and a useful section on Sputum Examinations. Dr. C. T. Holland supplies a well-illustrated general section on Radio-Activity and Electro-Therapeutics. There is a list of "Sanatoria for Consumption and Other Forms of Tuberculosis," which, however, might wisely be amplified. Dr. N. Hay Forbes has revised notes on "Principal British Spas," with indications for their therapeutical employment. The *Medical Annual* is scarcely a work requiring review or commendation, for it should be in the possession of every British medical practitioner both at home and abroad.

The tenth issue of "Medical Homes for Private Patients"[1] has just appeared. It is a serviceable directory of nursing homes and other institutions for the care of patients. There is a list of sanatoria, but this could be improved by revision and amplification. Lists are also given of consultants.

The Board of Agriculture and Fisheries have issued a tract on "Tuberculosis in Farm Stock."[2]

The fifth edition of Thompson's much valued "Compendium" has just been issued.[3] It is a reference manual which is indispensable to all engaged in prescribing and dispensing. Every medical practitioner should keep a copy within reach. The new edition has been thoroughly revised and brought up to date. In addition to synopses of pharmacopœias and formularies, it contains an index of diseases and remedies, analytical notes and data regarding special tests, bacteriological memoranda, notes on stains for microscopical work, and much other practical material which will be of the greatest service to doctors and pharmacists.

Mr. Sherman C. Kingsley, Director of the Elizabeth McCormick Memorial Fund, has prepared a splendid illustrated brochure on "Open-Air Schools," in connection with the exhibit in the Palace of Education and Social Economy at the Panama-Pacific Exposition.[4]

[1] "Medical Homes for Private Patients, 1915" (tenth year). A Classified Directory, with Alphabetically-arranged Lists of Medical Consultants. Edited by R. Pritchard Binnie. Pp. 172. London: The Scientific Press, Ltd., 28 and 29, Southampton Street, Strand, W.C. 1915. Price 6d. net.

[2] Board of Agriculture and Fisheries, Leaflet No. 277: "Tuberculosis in Farm Stock." Pp. 7. Copies may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

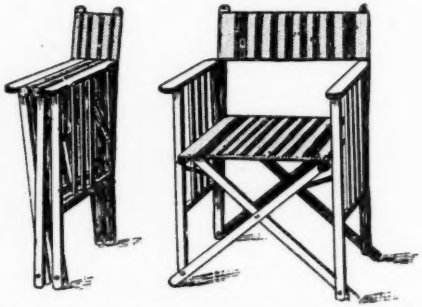
[3] "A Compendium of the Pharmacopœias and Formularies (Official and Unofficial), with Practical Aids to Prescribing and Dispensing." A Handy Pocket-Book of Reference for Medical Practitioners, Pharmacists, and Students. By C. J. S. Thompson. Fifth edition. Pp. vi+398. London: John Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, W. 1915. Price 5s. net.

[4] "Open-Air Schools," by Sherman C. Kingsley, Director of the Elizabeth McCormick Memorial Fund. Pp. 54, with illustrations. Published by the Elizabeth McCormick Memorial Fund, 315, Plymouth Court, Chicago, Ill., U.S.A. 1915. Price 25 cents.

PREPARATIONS AND APPLIANCES.

A NEW FOLDING-CHAIR.

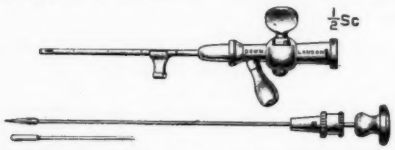
From time to time we have given notices of chairs and similar equipment for sanatoria, open-air schools, and other institutions and homes where outdoor living is practised. A new form of chair has recently been introduced. The chief features of The "Compactum" Folding-Chair is shown in the adjoining illustration.[1] Its design is



ingenious, and in action it is thoroughly efficient. The framework is of hard, well-seasoned wood, and the seat and back are of stout striped canvas. The middle of the seat is 18 inches, and the whole weight is 11 pounds. As is shown in the figure, the chair folds up, and so occupies but little space and can be easily carried. Having thoroughly tested this novel and reliable chair, we can strongly recommend it.

TROCAR AND CANNULA FOR ARTIFICIAL PNEUMOTHORAX.

The accompanying illustration indicates a new Trocar and Cannula for inducing artificial pneumothorax.[2] It is on the principle of Potain's trocar, and has been suggested by Dr. Clive Riviere for giving first inductions of pneumothorax safely and without the risk of wounding the lung, which is well recognized as being a serious drawback in the use of the usual form of sharp hollow needle commonly used for the purpose. The advantages sought seem to be well attained in this instrument. The depth of its penetration is controlled by a stop; it can be instantly converted into a blunt



[1] The "Compactum" Folding Chair can be obtained from Messrs. Derry and Toms, Kensington High Street, London, W. Price 7s. 11d.

[2] Dr. Clive Riviere's Trocar and Cannula is made by Messrs. Down Bros., 21 and 23, St. Thomas's Street, London, S.E.

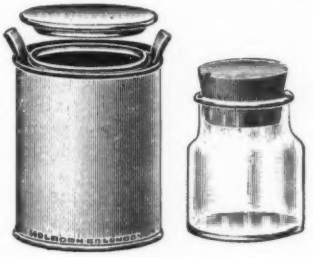
instrument as soon as the skin and deep fascia are pierced, and the blunt cannula is then pushed forward into the pleural cavity without danger. The addition of a stuffing-box securely fastened to the mount of the cannula averts the otherwise possible danger of air-embolism should the needle enter a vein. In use the needle is connected by tubing to the manometer, with the trocar in place; the slide stop is adjusted to 1 centimetre or somewhat less than the distance between the surface of the skin and the pleura. The instrument is first pushed in up to the stop, which is then drawn back, and the trocar can be freely withdrawn into the stuffing-box, which is held securely in position by a bayonet catch. The tap is now closed, and the trocar pushed on into the pleural cavity, and all danger of wounding the lung is therefore entirely avoided. A blunt guide is also supplied for clearing the cannula. This is fitted with a stuffing-box and bayonet catch, which may be fixed in place before the tap is opened and the guide pushed forward.

A NEW STETHOSCOPE.

Many and varied are the forms of stethoscope now in use. A new variety has recently been introduced by Messrs. Reynolds and Branson, and designated the M.A. STETHOSCOPE.[1] The effective portion consists of a mouthpiece of a kind of ear-trumpet as used by the deaf. This chest-piece is surrounded by rubber, and is connected by two flexible rubber tubes with vulcanite ear-pieces. It can readily be carried in the pocket, and is a very convenient form of binaural stethoscope.

A POSTAL SPUTUM RECEPTACLE.

It is often desirable to forward sputum to a clinical laboratory or other centre for pathological research and investigation. This can only be done through the post provided certain regulations are complied with. THE "HOLBORN" SPUTUM BOTTLE provides an excellent receptacle for this purpose.[2] It consists of a bottle having a wide mouth fitted with stout ordinary corks or rubber bungs. This is fitted into a tin complying with postal regulations and having full directions attached. This receptacle for the collection and conveyance of sputum through the post should prove of much service to



[1] The M.A. Stethoscope is manufactured by Messrs. Reynolds and Branson, Ltd., 13, Briggate, Leeds. Price 7s. 6d.

[2] The "Holborn" Sputum Bottle is supplied by the Holborn Surgical Instrument Company, Ltd., 26, Thavies Inn, Holborn Circus, London, E.C. Price, with ordinary corks, 3s. 6d. per dozen; with sterilizable rubber bungs, 6s. 6d. per dozen; bottles only, 1s. 6d. per dozen; tins, 1s. 6d. per dozen; corks, 6d. per dozen; rubber bungs, 3s. 6d. per dozen.

medical officers of health, school doctors, tuberculosis officers, as well as to physicians in consulting work, and general practitioners.

"ALLENBURYS" FOOD PRODUCTS.

Messrs. Allen and Hanburys, Ltd., have won well-deserved distinction for the excellency of their "ALLENBURYS" CONCENTRATED FOOD PRODUCTS.[1] These have proved of much service to motorists and cyclists, aviators, sportsmen, and athletes, travellers and explorers, and now are being extensively used by our soldiers and sailors on active service. These preparations are also often valuable in the management of delicate and debilitated cases and the treatment of certain classes of patients. They are often of value for tuberculous and other persons undergoing open-air management. "Allenburys" Diet is a partially predigested and easily assimilated food in powder form. "Allenburys" Diet Chocolate-Flavoured Tablets are composed of the essential constituents of pure rich milk, whole wheat and chocolate. The "Allenburys" Nutrient Lozenges contain the elements of pure milk, whole meat, and the soluble extractives of the best form of lean beef. The "Allenburys" Meat-Soup Squares afford a reliable and speedy means for the preparation of a highly nutritious, delicious, and sustaining soup. These preparations only require to be known to be appreciated and used.

AERTEX CELLULAR CLOTHING.

In previous issues of this journal we have drawn attention to the valuable features of AERTEX CELLULAR CLOTHING.[2] It was invented in Great Britain, and is entirely of British manufacture, and it is stated also that the shareholders are all British; so clearly it deserves fullest support. The Aertex garments are ideal for the healthy, the debilitated, and the diseased. They are suited for use both at home and abroad, and both sexes and all sizes and ages can be provided for. For those who have to follow an open-air life, whether for health or in the pursuits of war or peace, cellular clothing provides a perfect form of hygienic underwear. We would, however, in this journal direct special attention to its many advantages for tuberculous and tuberculously disposed persons. For all such care must be taken to provide comfortable and strictly hygienic underclothing. In too many instances this matter is neglected, or only imperfectly dealt with. We have experimented fully with Aertex Cellular Clothing, and consider it unsurpassed by any other form of underwear. The cellular character of the fabric permits of unrestrained action of the skin and the free passage of perspiration. The warmth of the body is retained by the air contained in the meshes. This acts as an effective non-conductor.

[1] Specimens of the above preparations, with full particulars, will be sent to any medical practitioner on application being made to Messrs. Allen and Hanburys, Ltd., 37, Lombard Street, London, E.C.

[2] Full particulars regarding Aertex Cellular Garments may be obtained on application to the headquarters of the Cellular Clothing Company, Ltd., 72 and 73, Fore Street, London, E.C.

In summer the clothing is particularly light and cool, while in winter warmth is secured without oppression. The cellular clothing exercises no irritation even to the most sensitive skin. The garments made with this material are readily washed, do not shrink, and are inexpensive and very durable. The Aertex Cellular Sheets are excellent for tuberculous and delicate subjects. Even when the air is damp and climatic conditions trying, and the patient liable to sweating, these sheets are warm and comfortable. They are excellent for children and young persons. Reference may here be made also to the Non-Actinic red garments, which have proved of great service in the tropics. It should also be noted that the khaki-coloured Aertex sheets are now being extensively used by officers and many men both at home and on active service.

THE "EMANDEM" EAR SYRINGE.

In hospital, sanatorium, and private practice there is often need for the use of a good ear syringe. The forms in common use leave much

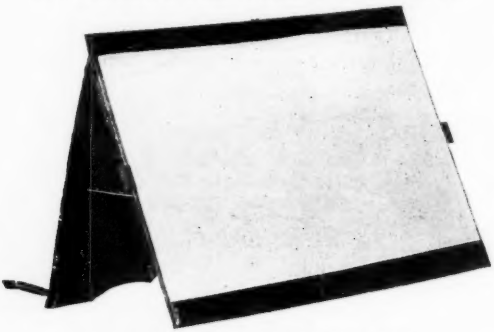
to be desired; we are therefore glad to welcome Dr. Ferguson's "EMANDEM" EAR SYRINGE, the chief features of which are illustrated in the accompanying illustration.[1] The syringe is provided with a nozzle fashioned like an ear speculum. This is fitted with an efferent tube, so shaped as to give a flat stream of water, which is directed along the meatus and passes over the tympanic membrane. Considerable force can be used without danger of injury, for the outflow from the speculum is greater than the ingoing stream. Accumulated wax and foreign matter can be easily removed with this rationally designed syringe. The operator can keep the meatus and the tympanic membrane under observation while syringing, and can effectively manœuvre so as to remove any foreign body which may be present. The smaller nozzle shown in the figure can be supplied when the syringe is for the patient's own use, and it can be used with safety even by unskilled persons.

[1] Dr. Ferguson's "Emandem" Ear Syringe is made by Messrs. Mayer and Meltzer, 71, Great Portland Street, London, W. Price 8s. 6d.

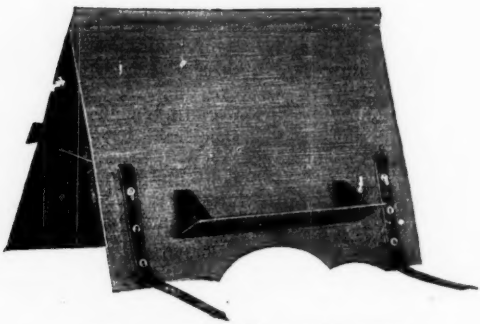
A POCKET MEDICINE CASE.

The accompanying illustration affords a descriptive picture of the new "KNAPSACK" MEDICINE CASE,[1] which has been introduced for the use of medical officers and others on duty in various parts of the world defending the Empire. It is so compact, light, and portable that it is certain to be popular both at home and abroad. The body of the case is composed of compressed cork, which protects the enclosed glass tubes against breakage. The case is of good workmanship. It contains sufficient medicaments for use on trench duty: these are usually quinine, cascara, chlorodyne, acetylsalicylic acid, and iodine tincture, but the contents can, of course, be varied if desired.

A WRITING-PAD AND BOOK-REST.



THE "LIANRITE" AS WRITING-PAD.



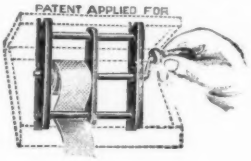
THE "LIANRITE" AS BOOK-REST.

Under the designation of THE "LIANRITE" there has recently been introduced a simple, inexpensive, but very serviceable combined

[1] The "Knapsack" Medicine Case is supplied by Messrs. Allen and Hanburys, 7, Vere Street, Cavendish Square, London, W. Price 7s. 6d.

writing-pad and reading-desk.[1] Its essential features are indicated in the accompanying figures. It is an ingenious, light, and readily adjusted appliance for invalids and bed-fast cases. It combines the functions of blotting-pad, stationery-case, and book-rest. When not in use it folds up flat. For many sanatoria cases and patients carrying out open-air treatment this novelty will be a real boon. We understand large numbers have been supplied to our wounded soldiers and to members of the navy. We think the "Lianrite" would be useful in open-air schools.

A COMPACT BANDAGE-WINDER.



Bandages are much in evidence everywhere, and time and trouble are saved by the use of an effective winder. Messrs. A. E. Braid and Co. have introduced a neat, simple, and convenient little BANDAGE-WINDER which promises to be of considerable service.[2] Its chief points are indicated in the annexed figure. It is only 5½ inches square, and it can be employed without a clamp, held or fixed as indicated in the accompanying illustration.

A NEW FEEDING-CUP.

Shaw's Hygienic Spoutless FEEDING-CUP will be found of value in sanatoria, military hospitals, and district nursing. It was originally supplied to the Plaistow Fever Hospital, London, E. The cup has neither spout nor overflow guard, but it is an effective feeder for institutional and private nursing.[3]

"CHRISMOL" PREPARATIONS.

Messrs. Allen and Hanburys have introduced an excellent series of refined, redistilled liquid paraffin preparations which promise to be of much service in the management of tuberculous and other chronic diseases. "CHRISMOL" is a bland, colourless, odourless, and tasteless pure liquid paraffin. It can be obtained flavoured, in capsules, as a confection, and as an emulsion, and also in association with malt extract.[4]

THE CARE OF THE GARDEN.

All responsible for the successful development of a sanatorium, open-air school, or other establishment where out-door duties occupy a prominent place, soon find that they have to carry on a struggle

[1] The "Lianrite" can be obtained in art linen, price 3s. 6d., or with leather front, price 5s., from Messrs. Truslove and Hanson, 6B, Sloane Street, London, S.W.

[2] The Bandage-Winder, supplied by Messrs. A. E. Braid and Co., Ltd., 30, Gower Place, Gower Street, London, W.C., costs 1s. 6d. in box.

[3] The Shaw Hygienic Spoutless Feeding-Cup is supplied by Messrs. A. E. Braid and Co., Ltd., 30, Gower Place, Gower Street, London, W.C.

[4] Full particulars and specimens of the "Chrismol" preparations can be obtained on application to Messrs. Allen and Hanburys, Ltd., 7, Vere Street, Cavendish Square, London, W.

with parasites and pests of various kinds, if they are to preserve their plants and flowers from destruction. Messrs. E. A. White, Ltd., have issued a new edition of their practical manual, "In a Perfect Garden," which we commend to the notice of those who desire sound guidance regarding the prevention and arrest of insect attack, fungoid disease and other ravaging invasions.[1] The brochure provides explicit directions for the destruction of aphides, ants, caterpillars, earwigs, leaf-hoppers, mildew, red spider, rust, scale, thrips, maggots, wasps, and other enemies of flowers and fruits, plants and trees. The "APIOL" INSECTICIDE is one of the best preparations for dealing with the ravagers of our gardens. It has many advantages. It is non-poisonous, is always ready for use, does not damage the flowers, roses, plants, or trees to which it is applied, is clean and pleasant to work with, and is thoroughly effective, and, moreover, is not expensive. It is best used with the "ABOL" PATENT SYRINGE. This is a most reliable instrument. It is of admirable design and excellent workmanship, and cannot be beaten for use both in the garden and in the greenhouse. The nozzle is so constructed as to give a perfect mist-like fine spray which allows the insecticide to be used as effectively as is possible. Nozzles of various size can be used. This is the most reliable syringe on the market. It should also be noted that the "ABOL" MAGNIFYING-GLASS, fitted with a good lens and made of well-finished brass, with adjusted focus and protected by a brass shield, will be found of service in locating the enemies.

[1] Messrs. E. A. White, Ltd., Paddock Wood, Kent, the sole proprietors and manufacturers of "Abol," will be glad to forward a copy of "In a Perfect Garden" on application. A free sample of the "Abol" Insecticide will be sent on receipt of 3d. in stamps to cover postage. The "Abol" Patent Syringes vary in price from 8s. 6d. to 14s. 6d., according to size.

NOTES.

THE TREATMENT OF TUBERCULOSIS.

WAR is making all forms of medico-sociological work increasingly perplexing and difficult. This is particularly the case in regard to tuberculosis. We have need of exceptional powers of adaptation to meet the exceptional needs of the present. The Local Government Board on April 29 issued a circular to the councils of counties and county boroughs dealing with the organization, development, and completion of schemes for the institutional treatment of tuberculosis. The points raised are of such importance that we think it desirable to reproduce the essentials in the present issue of this journal: "1. *Tuberculosis Officers.*—The Board are aware that some Tuberculosis Officers are absent on Naval or Military duty, but if in any case such absence has not already been reported to them this should be done, and the Board should be at once informed of the arrangements which have been made, or are proposed to be made, for the temporary discharge of the duties of the officer, in order that their approval may be obtained. The Board should also be informed of any resignation of a Tuberculosis Officer, and application should be made for their approval of the appointment proposed to be made in consequence of the resignation. In this connection the Board wish to draw attention to recommendation (3) in paragraph 48 of the Final Report of the Departmental Committee on Tuberculosis (Cd. 6641), 1913, as to the additional qualifications which should be required in the case of Tuberculosis Officers appointed after January, 1915. At the present moment it may be difficult in all cases to secure that Tuberculosis Officers should have these additional qualifications, but the Board trust that the Council, in making any fresh appointment, will have due regard to the recommendation, and, in framing advertisements for candidates for the post of Tuberculosis Officer, will intimate that preference will be given to medical practitioners possessing these qualifications. 2. *Use of Sanatoria and Hospitals for Military Purposes.*—In some cases, sanatoria and hospitals which have been approved by the Board under the National Insurance Act, 1911, for the treatment of tuberculosis, are being temporarily placed at the disposal of the War Office for cases of infectious disease occurring among the troops, or for the nursing of sick and wounded soldiers. The Board must be informed immediately any such institution in the area of the Council ceases to be available for the treatment of tuberculosis. 3. *Treatment of Children.*—I am to refer to the remarks contained in the Board's circular letters of the 14th May, 1912, and 7th November, 1913, in regard to the treatment of children suffering from tuberculosis, and to state that arrangements have now been made whereby the Board will undertake the investigation of proposals for the treatment of tuberculous children and of applications for capital grants in aid of the provision of children's institutions, and communications on this subject should

now be addressed to the Board instead of, as formerly, to the Board of Education. I am to remind the Council that the capital grant available for aiding the provision of institutions for the treatment of tuberculosis is a fixed sum, but the maintenance grant of 50 per cent. of the net annual expenditure of the Council on the treatment of this disease will be available in aid of expenditure (including loan charges) incurred in providing institutional treatment for tuberculous children in accordance with proposals approved by the Board. Provision for the institutional treatment of children should usually be made by the Council, in their capacity of Public Health Authority, as part of their general scheme for the treatment of tuberculosis. The arrangements should extend to children of all ages, and, in the case of County Councils, to children resident in the areas of other local education authorities within the administrative county. The Board will be glad if the Council will give consideration to the question of the residential accommodation which is required for the treatment of tuberculous children resident in the area of the Council, and of the means whereby this accommodation can best be provided. In some cases the Council will be able to obtain the necessary accommodation, either for pulmonary or non-pulmonary cases, or for both, at existing institutions which have already been approved by the Board or at projected institutions which are to be provided with their approval, and in such cases it will not be necessary for the Council themselves to provide additional accommodation. The Board are of opinion that, where practicable, use should be made of suitable voluntary institutions, and where such an institution can readily be extended, economy will be secured by the provision of additional accommodation at the institution. I am to refer to section 9 of the Board's circular letter of the 7th November, 1913, as regards the conditions on which capital grants may be made to voluntary institutions. In cases where it is necessary for a council themselves to provide accommodation for the treatment of tuberculous children, the Board desire to make the following general observations: The Departmental Committee on Tuberculosis recommended that separate institutions, or, at least, separate pavilions or departments, should be provided for the treatment of children suffering from tuberculosis. The Board are advised that cases of pulmonary tuberculosis in children may properly be treated in separate pavilions at sanatoria provided for the treatment of adults, though where a large number of beds are required for children suffering from pulmonary tuberculosis it may be preferable to provide separate institutions. The treatment of non-pulmonary tuberculosis, especially tuberculosis of the bones and joints, requires the provision of expensive apparatus and the employment of skilled surgeons, and, if economy is to be secured, the necessary accommodation for the treatment of children suffering from non-pulmonary tuberculosis must be provided in institutions each containing 100 beds or more. The Board consider that unless provision is required for 100 or more patients it will not usually be advisable for a council to provide independently an institution for children suffering from non-pulmonary tuberculosis, and if a council are unable to obtain the accommodation required at an existing children's institution which has been approved by the Board, or at a projected institution which is to be provided with their approval, it appears to the Board that they should endeavour to arrange with other councils for the

joint provision of an institution of suitable size. I am to add that the Board will consult the Board of Education before approving the plans of sanatoria for the treatment of children, and as to the arrangements required for the education of children at any institution which is to be provided by a council or a combination of councils, or at any institution in which children are proposed to be treated. The requirements of that Board in regard to education in any particular case must be satisfactorily met. Institutions in which children are to receive both treatment and education, whether provided by a council, a combination of councils, or some other body, will usually be approved by the Board under the National Insurance Act, 1911, and certified by the Board of Education under the Elementary Education (Defective and Epileptic Children) Act, 1899. 4. *Medical Education.*—The Board direct me to refer to paragraph 48 of the Final Report of the Departmental Committee on Tuberculosis, and to state that facilities to attend the dispensaries and other institutions provided by the Council for the treatment of tuberculosis should be afforded to medical students and practitioners, in order that they may acquire familiarity with the methods of diagnosis and treatment which are adopted in those institutions. The Board wish to emphasize the advantages which may be expected to result both to the public and to the medical profession if full use is made of such facilities. In their circular letter of the 7th November, 1913, the Board stated that, wherever practicable, arrangements should be made for linking up dispensaries with general hospitals or hospitals for consumption; and they consider that, where the authorities of any hospital, which is associated with a medical school, are willing to establish a tuberculosis dispensary or consultative centre at the hospital, the council of the area in which the hospital is situated should endeavour to arrange for the inclusion of the institution in their scheme. With regard to recommendation (4) in paragraph 48 of the Final Report, the Board think that the Council should consider the practicability of allowing their Tuberculosis Officers to avail themselves of any reasonable opportunity which presents itself for attending post-graduate instruction which would be of value to them in the performance of their duties. 5. *Relation of General Practitioners to Dispensaries.*—The Board direct me to refer to what is said in their circular letter of the 6th December, 1912, under the heading 'The Dispensary,' and to state that they desire to offer some observations on the question of the position of general practitioners in relation to the work of the dispensaries. The Departmental Committee on Tuberculosis in their Interim Report (Cd. 6,164), 1912, laid stress on the importance, in any scheme for dealing with tuberculosis, of enlisting the hearty co-operation and stimulating the interest of general medical practitioners. The Board entirely concur in this view, and regard it as important to secure all possible assistance from practitioners who are familiar with the home conditions of the patients. When a patient first attends a dispensary, it is desirable that his own doctor should inform the dispensary officer of any facts with which he may think that the dispensary officer should be made acquainted, and that the dispensary officer should inform the practitioner of the result of his examination of the patient, and as to the form of treatment which he advises. He should also be prepared to consult with the practitioner from time to time, and the practitioner should be encouraged to visit the dispen-

sary. It will be a matter for consideration in each case whether, in the best interests of the patient, he should be advised to undergo treatment in a residential institution, and, if not, whether the treatment required can best be given by co-operation between the dispensary and the private doctor, or by either of them separately. If the patient is an insured person, and is an applicant for sanatorium benefit under the National Insurance Act, 1911, the dispensary officer should send a report on the patient to the Insurance Committee, and should inform them of the treatment which he advises. The arrangements at the dispensary should be such as to allow all persons suffering from, or suspected to be suffering from, tuberculosis to obtain the full advantage of the expert services which the dispensary affords; and in the case of those uninsured persons who have no doctor, no obstacle should be placed in the way of their obtaining from the dispensary all the treatment of which they are in need which can be provided by the dispensary. The dispensary officer should, however, point out to such persons the importance of their being in a position to call in a doctor on short notice in case treatment at home is required. Any insured persons attending the dispensary who have not yet selected a doctor should be advised to do so forthwith. In this connection it must not be assumed that the dependants of an insured person necessarily have a doctor of their own. 6. *Examination of Contacts.*—The examination of the 'contacts' of a patient notified to be suffering from tuberculosis is necessary, not only in the interest of the individual, but also as a public health measure, and it appears to the Board that the services of the medical officers of dispensaries should be utilized for this work. At the same time the Board consider that, where the person to be examined is under the care of a medical practitioner, the person should inform the practitioner that he is going to be examined, and the dispensary doctor should communicate the result of the examination to the practitioner. 7. *Tuberculosis Care Committees.*—The Board desire to draw attention to the following extract from the Interim Report of the Departmental Committee on Tuberculosis in regard to the organization of committees for the care of patients suffering from tuberculosis: 'The effectiveness of the work of the dispensary can be greatly increased by the organization of voluntary care committees, formed of representatives from the Local Authorities, Boards of Guardians, Insurance Committees, and from all charitable and social work organizations in the district. In this way all available agencies can be linked up, and any extra assistance—such as additional food, change of air, clothing, better home conditions, more suitable occupation, etc. —that may be needed to enable patients to benefit to the fullest extent from the treatment provided may often be readily secured. The secretary of the care committee may conveniently be a member of the dispensary staff, and it is desirable that the chief tuberculosis officer of the dispensary should attend the meetings of the committee, to advise its members as to the particular form of assistance necessary for each individual patient. In connection with this part of dispensary work in rural districts, it may be found of assistance, where the patients are willing, to have a system of voluntary correspondents who report from time to time with regard to patients in the several districts served by the dispensary.' It appears to the Board to be important that committees such as the Departmental Committee recommended should be

organized in every area for which a scheme for the treatment of tuberculosis has been adopted; and, inasmuch as the work of these committees should relate to the whole community, their organization should be undertaken under the general direction of the councils of counties and county boroughs, who are responsible for schemes of treatment. In many counties, and possibly also in some county boroughs, district committees working under the tuberculosis care committee would be of advantage. Much of the work to be undertaken by these committees is outside the powers of local authorities; and although the committees are organized by local authorities, they will really be voluntary committees, and steps should be taken to secure that all the various charitable and voluntary agencies are represented on the committees. Medical Officers of Health and Tuberculosis Officers should be *ex-officio* members of the committees, and School Medical Officers, who are not also Medical Officers of Health, may usefully be included. The committees will have to rely largely on voluntary contributions for meeting their expenditure, but the Board consider that the Council may properly provide, from their own resources, care committees with such secretarial and clerical assistance and office facilities (including stationery and postage) as the Council regard as reasonably necessary. Subject to the Board's approval, the cost incurred for this purpose may be charged to the tuberculosis account of the Council. Schemes for the organization of tuberculosis care committees should be submitted for the approval of the Board before being finally adopted. 8. *Nursing.*—The Board have had under consideration the question of the provision by the councils of counties and county boroughs of nursing for persons suffering from tuberculosis who are being treated in their own homes. The Board recognize that the provision of skilled nursing for some of these cases forms an essential part of the treatment, and it is desirable that nurses already employed at the dispensaries who have sufficient time for this work should undertake the nursing of patients in their own homes. The Board are willing to consider an application from the Council, under Section 3 of the Public Health (Prevention and Treatment of Disease) Act, 1913, for their sanction to arrangements of this kind, which may be extended, when circumstances permit, by the employment of additional nurses, either direct or by arrangement with a voluntary nursing association. At present, however, the need of nurses for military purposes will probably preclude any extension of the nursing service in this direction. Any application should be accompanied by a full description of the actual proposals, and an estimate of the annual expenditure which will be involved. Additional nurses engaged for this work should be placed on the staff of a dispensary, and the arrangements for the allocation of the time of the nurses should be made by the medical officer of the dispensary, under the general supervision of the Medical Officer of Health. A doctor who finds that skilled nursing is required for any case of tuberculosis under his care should send particulars of the case to the medical officer of the appropriate dispensary, and should give his reasons for considering that a nurse should be provided by the Council. It is important that the provision by a local authority of nursing in the homes of persons suffering from tuberculosis should not be allowed to interfere with the removal to a sanatorium or hospital of cases which, in the opinion of the Tuberculosis Officer, can best be treated in such an institution, or

of cases which, owing to their infectious condition, may be a source of danger to the other inmates of the home. This consideration should be carefully borne in mind in the administration of any scheme for the provision of nursing."

THE PHYSIOLOGY OF OPEN-AIR TREATMENT.

Professor Leonard Hill has embodied the results of an extended investigation regarding respiratory exchange in man under varying climatic conditions in his official Report to the Local Government Board.[1] The report is of exceptional interest and particular value to those responsible for the organization and conduct of so-called open-air treatment. The conclusions are of such importance that we think it wise to reproduce them here: "The curative influence of open-air treatment and exercise depends on the increased metabolism of the body which is accompanied by a more ample ventilation of the lungs, more vigorous circulation, better appetite and digestion, and lessened bacterial decomposition in the large bowel. It is rather by these ways than by auto-inoculation that the beneficial effects are obtained in the treatment of phthisis. The movement of the air, producing an adequate cooling of and stimulating effect on the skin, is the prime factor in ventilation, and crowded tenements and cities owe their deleterious effects to the withdrawal of the citizens from the adequate action of moving air and sunlight, and not to any chemical impurity of the atmosphere which they breathe, leaving on one side the question of dust in the atmosphere. There seems to be no advantage in open-air treatment on cold damp days when the atmosphere is still and saturated with moisture. Exposure to such an atmosphere produces a sensation of cold owing to the water vapour in the air, which cools the nerve endings in the warm skin of the face and hands; it does not produce the advantageous increase in metabolism or the stimulating effect which is produced by air movement acting on the whole cutaneous surface. Bracing places are those where the metabolism is increased most by free movement of cool and not too humid air. Sanatoria should not be placed in situations so sheltered that the air is apt to be still and overladen with moisture. It is inadvisable to surround suburban houses with trees and shrubs, which blanket them with a stiller and moister air. The beneficial effect of garden cities, as far as atmosphere goes, is to be sought in the freer movement and greater relative dryness of the air both inside and outside the houses. It is well known that artificial methods of warming cannot be applied with any advantage to the raising of animal stock, and such methods should be so used by man as to diminish to the least degree the energy output of his own body, commensurate with his efficiency in work. Overheated rooms and still air decrease the activity of the body furnace, and so lead to lessened vigour and resistance to disease. Particularly is this the case if overeating accompanies overheating, for the

[1] Reports to the Local Government Board on Public Health and Medical Subjects (New Series, No. 100)—"Report on Ventilation, and the Effect of Open Air and Wind on the Respiratory Metabolism." By Professor Leonard Hill, F.R.S. Pp. 47, with 7 figs. London: Wyman and Sons, Ltd., 29, Bream's Buildings, Fetter Lane, E.C. 1914. Price 9d.

TROPHY AWARDED THE CANADIAN ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS BY THE INTERNATIONAL CONGRESS OF HYGIENE, ROME, 1912.

food eaten is not required to keep the body warm, and undergoes bacterial decomposition in the bowel with the consequent deterioration of health. The overheated air of rooms with the rapid changes of temperature from this air to the outside winter air leads to the disturbed function of the respiratory mucous membrane, with the consequent acquisition of 'colds' and respiratory infections. It is not the cold outside air which causes the trouble, but the overheated atmosphere of the room. The general belief that exposure to cold is the cause of all trouble is greatly to be deprecated. So far as real evidence goes, those who expose themselves freely to open air and cold weather become hardy and vigorous and do not take 'cold.' Excessive protection from cold weather by overclothing, overheating, and shutting out of wind lessens immunity and increases the susceptibility to such diseases as pneumonia and phthisis. The evidence of this research is in favour of open-air schools, open workshops, garden cities, and means of affording sedentary workers opportunities of open-air exercise to counteract the effect of their employment in still warm atmospheres. When it is generally realized that it is the physical and not the chemical conditions of confined atmospheres which influence health and happiness, a vast improvement in the condition of home and industrial life will be effected." The report of this well-planned investigation certainly goes far to justify open-air treatment as usually carried on in the sanatoria of this country.

THE ANTI-TUBERCULOSIS MOVEMENT IN CANADA.

At a time when Canadians are accomplishing great deeds for the protection of the Empire, it is well to remember that in no other part of our overseas Dominions has the Anti-Tuberculosis Campaign been more effectively conducted. Through the courtesy of the Secretary of the Canadian Association for the Prevention of Tuberculosis, Dr. George D. Porter, we are permitted to give an illustration of the trophy awarded the Association at the last International Congress of Hygiene, held in Rome. We are also able to furnish an illustration of the new Perley Memorial Sanatorium at Ottawa, intended for the treatment of incipient cases of pulmonary tuberculosis.

RECORDS OF PROGRESS.

During the continuance of the great war progress in tuberculosis work must necessarily be hindered. The need, however, for maintaining means and measures in effective condition must not be forgotten. It is essential that there should be fullest co-operation between State and voluntary endeavours aiming at the prevention of tuberculosis, and striving to secure the arrest or amelioration of all forms of tuberculous disease.

Dr. Theodore B. Sachs and his co-workers have issued a well-illustrated descriptive account of the evolution and completion of the

THE PERLEY MEMORIAL SANATORIUM, OTTAWA, 1913 (FOR INCIPIENT CASES).

Chicago Municipal Scheme for dealing with Tuberculosis.[1] The plans and pictures of the new sanatorium form special features of this fine record of work wisely conceived and successfully carried through.

The Ninth Report of the Henry Phipps Institute contains a series of fifteen studies. Among them are communications on Experimental Pulmonary Tuberculosis in the Dog; The Iodine Content of Tuberculous Tissues; Tuberculosis and Public Health; Jaundice in Tuberculosis; The Diagnosis of Tuberculosis in Early Life; and The Larynx in One Hundred Cases dying of Pulmonary Tuberculosis. All the studies appear as reprints. The volume affords ample evidence of the excellent work which is being carried out by the staff of the Henry Phipps Institute.[2]

The last Report of the Boston Consumptives' Hospital contains plans of the institution, with illustrations of the new children's ward.[3]

The new Report of the Loomis Sanatorium contains a series of illustrations of the various chief buildings of this excellent centre for the care of the tuberculous.[4]

The Eighth Report of the British Columbia Anti-Tuberculosis Society contains illustrations of the King Edward Sanatorium, Kamloops, B.C., and particulars of the work in various parts of the province.[5]

The Master of Christ's College, Cambridge, has written a particularly interesting account of the Open-Air Treatment of Sick and Wounded Soldiers at the First Eastern General Hospital, Cambridge.[6]

Lieut.-Colonel J. R. Kaye, M.B., D.P.H., County Medical Officer and Division Sanitary Officer for the West Riding of Yorkshire, has issued some excellent leaflets and posters admirably adapted for use in districts where troops are located.[7]

[1] "The Municipal Control of Tuberculosis in Chicago—The City of Chicago Municipal Tuberculosis Sanatorium: Its History and Provisions." Issued by the Board of Directors: Theodore B. Sachs, M.D., President; Frank E. Wing, Administrative Secretary. Pp. 96, with plans and illustrations. Chicago: 105, West Monroe Street. 1915.

[2] University of Pennsylvania—Ninth Report of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis. Published by the Henry Phipps Institute, Seventh and Lombard Streets, Philadelphia, U.S.A. 1915.

[3] Ninth Annual Report of the Consumptives' Hospital Department of the City of Boston for the Year ending January 31, 1915. Published by the City of Boston Printing Department.

[4] Eighteenth Annual Report of the Loomis Sanatorium for the Treatment of Tuberculosis. Published at Liberty Sullivan County, New York.

[5] Eighth Annual Report of the Directors of the Anti-Tuberculosis Society of the Province of British Columbia. 1914.

[6] "The Open-Air Treatment of the Wounded (The First Eastern General Hospital, Cambridge)." By A. E. Shipley, Sc.D., F.R.S., Master of Christ's College, Cambridge. With a Chapter by W. J. R. Simpson, C.M.G., M.D., F.R.C.P., Professor of Hygiene in King's College, London. Pp. 24, with illustration. London: *Country Life* Publishing Department, 26, Tavistock Street, W.C. 1s. net.

[7] Particulars and specimens may be obtained on application to the Public Health Department, County Hall, Wakefield.